PAKISTAN COUNCIL OF RESEARCH IN WATER RESOURCES

PCRWR

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ANNUAL REPORT 2021-22

Pakistan Council of Research in Water Resources (PCRWR)

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FOREWORD

In the wake of climate change, natural disasters have occurred frequently around the world and have been responsible for an enormous loss of life and property. Pakistan is among the countries that are most vulnerable to climate change. Extreme events like unprecedented rainfalls, heat waves and prolonged dry periods are being witnessed in the recent years. For instance, the rainfall-induced floods of 2022 are a classic example of this phenomenon. Torrential rainfalls and devastating floods changed the dynamics of the country. On the contrary, the nation has the lowest carbon footprint compared to many developed nations such as China and the United States of America. There are many ways to adapt and mitigate these challenges but a million-dollar question that we all face today is, from where to start? The answer to this question lies in adaptive agricultural water management, improving water security, regulated use of groundwater and above all changing the water use habits in all sectors.

Pakistan's economy highly relies on agriculture and related services. Climate-related disasters have multiplied the low productivity concerns in agriculture. Therefore, irrigation scheduling for major crops has become more critical. This calls for a demand-based irrigation system rather than a supply-based. In this regard, it is very important to ensure transparency of water distribution among the provinces through an advanced telemetry system. Likewise, quality assurance in the drinking water supply is also important that is not possible without better data and monitoring systems.

In addition to all technological interventions, dialogue and public awareness is very critical. During the year 2021-22, PCRWR launched Pakistan Water Week for the first time in the history of Pakistan. Dialogues and national workshops were also organized for stakeholders engagement. A high emphasis was given to the generation of knowledge products based on PCRWR research, such as IWRM implementation guidelines and the National Water Quality Monitoring reports.

Dr. Muhammad Ashraf
Chairman, PCRWR

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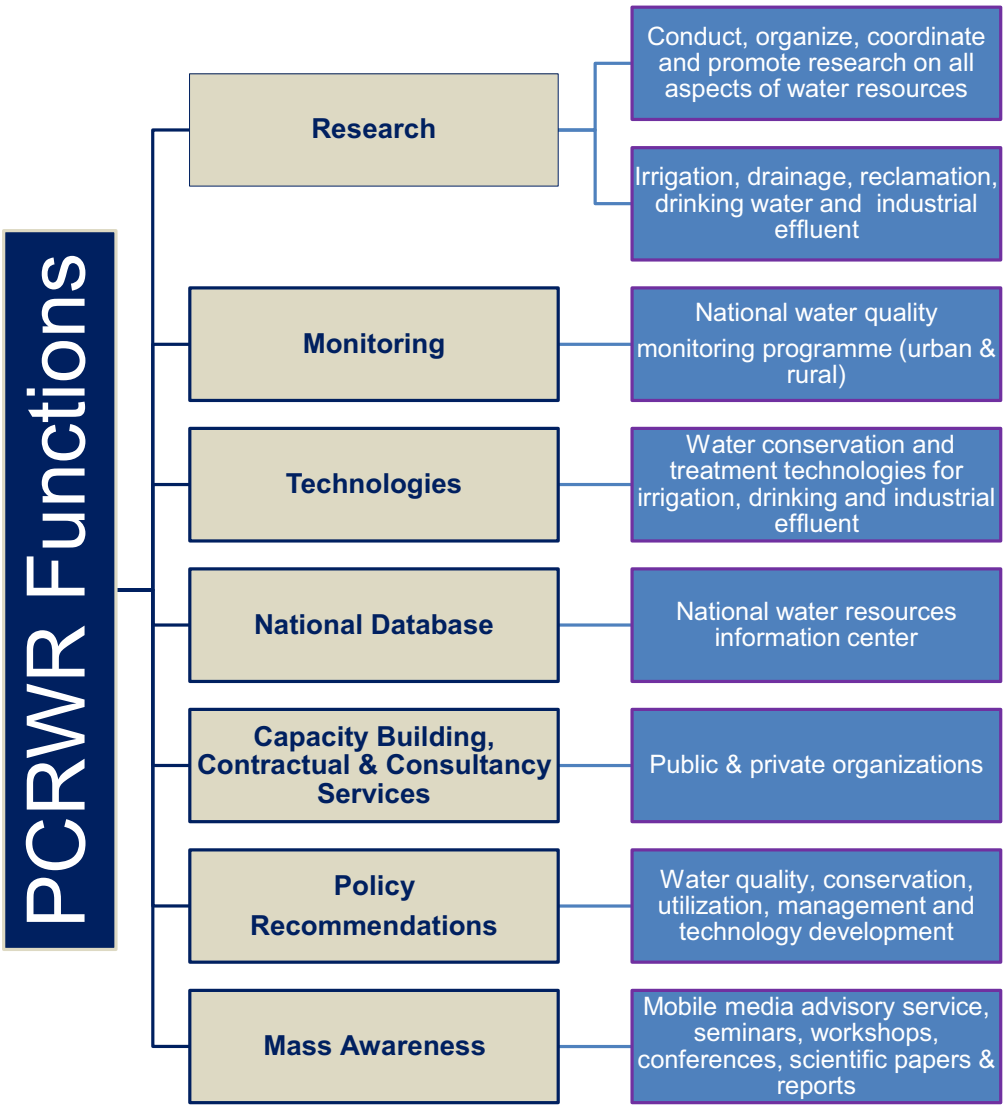
About PCRWR

Introduction

Pakistan Council of Research in Water Resources (PCRWR) was established in 1964 and is working as a body corporate through PCRWR Act 2007. The Council has been an apex body of Ministry of Science and Technology and was transferred under the administrative control of Ministry of Water Resources in May, 2022. It is mandated to conduct, organize, coordinate and promote research on all aspects of water resources. The functions assigned to PCRWR are given below:



Vision

By 2050, make Pakistan water secure while preserving the ecosystem

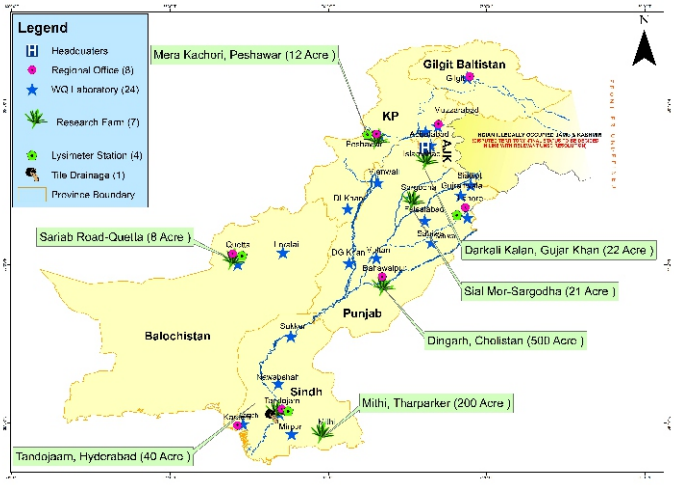
Mission

As a national organization thrive to find solutions to key water resource issues through action and adaptive research in collaboration with sectoral stakeholders

Research Establishments

PCRWR has played its role, as a leading water sector research and development (R&D) organization through a well-established state of the art research and dissemination infrastructure:

- Headquarters in Islamabad with eight regional offices at Tandojam, Quetta, Bahawalpur, Lahore, Peshawar, Karachi, Muzafarabad and Gilgit
- Water testing laboratories in 24 cities including; Islamabad, Lahore, Bahawalpur, Tandojam, Quetta, Peshawar, Faisalabad, Gujranwala, Mianwali, Sahiwal, Sargodha, Sialkot, D.G Khan, Multan, Badin, Hyderabad, Karachi, Nawabshah, Sukkur, Loralai, Abbottabad, D.I Khan, Muzaffarabad and Gilgit
- National Capacity Building Institute (NCBI), Islamabad
- A network of seven research and demonstration stations in different agro-climatic zones of the country
- GIS and Geo-hydrological laboratory, Islamabad
- Information and documentation Centre, Islamabad
- Drainage type lysimeters located at Tandojam, Lahore, Quetta and Peshawar to determine crop water requirements
- Soil Physics Laboratory, Islamabad



Major Research Areas

Mandate of PCRWR is broad in relation to the areas of different research in the country. However, the focused research areas are prioritized keeping in view the present resources and needs of the country.

PCRWR conducts its research keeping in view the needs of the country and in line with the National Water Policy 2018, Pakistan vision 2025, Sustainable Development Goals, PCRWR's research agenda and other related policies, such as Food Security Policy, Climate Change Policy, Drinking Water Policy etc.

Strength of Human Resource

Researchers

- Hydro-geology
- Environmental Microbiology
- Environmental Chemistry
- Agricultural Water Management

Professional Team

- Agricultural/Civil/Chemical/Electrical Engineers
- Geo-physics & Environmental Sciences
- Social Scientists
- Bio-Chemists/Chemists and Microbiologists
- Finance & Administration

Key Achievements/ Activities

Pakistan Water Week 2021

PCRWR and International Water Management Institute (IWMI) organized Pakistan Water Week 2021 from 6-9 December 2021 in collaboration with other partners with the theme "Needs for Sustainable Water management in a climate Crisis for Indus Basin". The main objective of this event was to address the issues related to water, awareness raising about the issue among the masses and transfer of knowledge from experts to the stakeholders. A series of events were organized to achieve the intended objectives.

International Event

An International Conference was held in Islamabad from 6th-7th December 2021. The conference was inaugurated by the President of Pakistan, Dr. Arif Alvi speaking at the conference, the President said that Pakistan's increasing vulnerability to climate change required urgent action on the management of water resources and for an improved system of water conservation at national and local levels. He stressed upon simultaneous steps to address the issue of water management, such as the policy on water pricing to inculcate a responsible approach among the masses to save valuable commodities.

Honorable President of Islamic Republic of Pakistan, Dr.Arif Alvi speaking on the occasion

Federal Minister for Science and Technology, Senator Syed Shibli Faraz said water conservation and management was an issue of major concern for the government in view of the depletion of groundwater resources. He said managing the vast resources of Himalayan glaciers and the country's fourth-largest aquifer was a big challenge to restore the ecosystem for the benefit of people.

Syed Shibli Faraz, Federal Minister S&T speaking at conference

Dr. Mark Smith, Director General, IWMI, highlighted that globally, water security is under pressure like never before. He said that Pakistan and the Indus Basin face these challenges, but with even greater intensity. He remarked that the implication of this conference should be the start of a transformational journey for water management in Pakistan – to safeguard the poor and marginalized communities and all the people of Pakistan.

Dr. Mark Smith, DG IWMI delivering speech

The inaugural session was led by a Plenary Session in which Dr. Jaffery Shaw, Australian High Commissioner, Ms. Annabel Gerry, Development Director, FCDO, Ms. Julie Koenen, Mission Director USAID, Ms. Yasmin Siddiqi, Director for Central and West Asia ADB, Dr. Muhammad Ashraf, Chairman, PCRWR, and Ms. Florence Rolle, FAO representative in Pakistan briefly highlighted the issues related to water and its impacts in relation with climate change.

After the plenary session, three parallel sessions were held on three different thematic areas. Under each thematic area, several sessions were held in which different panelists shared their experiences and way forward to address the theme of the session.

Glimpse of the key speakers of the event

Malik Amin Aslam Khan, Special Advisor to PM on Climate Change delivering concluding remarks

The closing session (on December 07, 2021) was co-chaired by Malik Amin Aslam, Special Advisor to Prime Minister of Pakistan on Climate change and Syed Fakhar Imam, Federal Minister for Food Security and Research Division. Malik Amin Aslam congratulated the organizers for successful event and also thanked the international participants to be the part of this conference. The Conference was ended by the concluding remarks of Syed Faakhar Imam, Federal Minister for National Food Security and Research Division.

National Event

A number of events were organized as part of Pakistan Water Week 2021, from 8th -9th December, 2021 at PCRWR Headquarters, Islamabad. These events consisted of debates, essay competition, water games for children, poster competitions among college and university students along with exhibition on water related technologies by different universities, industries and NGO's.

These two days were dedicated to the youth of the country to showcase their abilities and understanding related to water. At the end, closing ceremony was held on 9th December, 2022 at PCRWR, Headquarters, Islamabad and certificates were distributed to all the participants. The winners of the competitions were awarded with cash prizes. Some glimpses of the events are as given below;

Key speakers addressing at the closing session

Group photo of the students participated in competitions with organizers and guests

World Water Day 2022

Islamabad

World Water Day is celebrated on March 22nd every year. PCRWR celebrated WWD on 30th March, 2022 at its headquarters in Islamabad. Various activities were carried out at its regional offices and water quality laboratories in 24 cities to celebrate WWD during the month of March, 2022.

PCRWR in partnership with IWMI, UNESCO, ADPC, UN-HABITAT, UNICEF, UNESCO Water Chair, ICIMOD, CCRD, WaterAid, ECOSF and Riphah International University organized world water day event on 30th March, 2022. A round-table discussion was organized inviting key water experts from the country to shed light with reference to this year's theme "Groundwater-making the invisible visible". Taking the benefit of this event, United Nation's World Water Development Report 2022 was also launched in Pakistan.

Group photo of the participants

Speaking on the occasion, the Chief Guest, Lt. Gen (R). Nadeem Ahmed, National Advisor, Asian Disaster Preparedness Centre (ADPC) remarked that the subject of water needs to be incorporated into the syllabus starting from the primary education level. He further emphasized to use satellite technology for monitoring groundwater on a broader scale.

In his keynote speech, Dr Muhammad Ashraf, Chairman PCRWR, highlighted joint key efforts of PCRWR with partners, such as; piloting groundwater recharge wells in Islamabad, establishing a real-time groundwater monitoring network along the eastern border of Pakistan, and formulating a regulatory framework for groundwater governance in ICT region.

In his remarks, Mr. Haile Gashaw, Chief WASH, UNICEF remarked that his organization is willing to support the government of Pakistan in developing national strategic planning and allied assistance for the protection of groundwater in Pakistan. Mr. Arif Jabbar Khan, Country Director WaterAid stressed the need to involve public in developing policies.

Mr. Haile Gashaw, Chief Wash UNICEF speaking at WWD

The message of Director General UNESCO, Ms. Audrey Azoulay highlighted deep concern for depleting groundwater aquifers in the face of challenges posed by climate change and food insecurity of the growing population.

PCRWR Regional Offices

PCRWR Regional Offices in Lahore, Peshawar, Karachi, Quetta, Bahawalpur, Tandojam and its district water quality laboratories at Faisalabad, Sahiwal, Gujranwala, Sargodha, Sialkot, D.I Khan, and D.G Khan arranged walks, sessions and seminars with academia and other stakeholders to create awareness about ground water depletion, and its contamination.

Glimpse of the WWD celebrations at PCRWR Regional Offices

National Water Conference on

Emerging Water Challenges

Islamabad

Pakistan is facing a serious water crisis. The country is rapidly moving from being classified as water "stressed" to water "scarce"—and with its annual water availability falling below 1,000 cubic meters per person, it may in fact have already crossed this threshold

Pakistan Council of Research in Water Resources (PCRWR) in collaboration with International Water Management Institute (IWMI) and UNESCO Pakistan organized a National Conference on Emerging Challenge in Pakistan Water Sector on 15th July, 2021.

Syed Shibli Faraz, Federal Minister S&T Speaking on the occasion

Honorable Federal Minister for Science and Technology, Syed Shibli Faraz was the Chief Guest of the Conference. Speaking on the occasion, Syed Shibli Faraz said that despite being blessed with immense resources, Pakistan is facing grave challenges in the shape of climate change and water scarcity. Moreover, he applauded PCRWR and its allied partners on organizing the conference and emphasized that the outcomes of this conference shall be promulgated to international stakeholders in order to translate research into tangible development for public benefit so that the coming generations can have a water secure Pakistan.

Dr. Muhammad Ashraf, Chairman PCRWR addressing the participants

Dr. Muhammad Ashraf, Chairman (PCRWR) while addressing the conference, stressed on the importance of setting research priorities according to the emerging issues. He added that lack of data warehouse of water sector in Pakistan is an issue that needs to be addressed on urgent basis for sustainable management of water resources. He concluded with the proposal to arrange water weeks in Pakistan to facilitate Industry-Academia-Water experts to disseminate knowledge to all key stakeholders.

International Water Management Institute (IWMI), Country Representative, Dr. Mohsin Hafeez highlighted that the policy making is being done with noble intentions, but without evidence based knowledge and data, these polices are doomed to fail. Therefore, there should be a mechanism to develop a central database in collaboration with all national stakeholders and sectoral institutions. He added, that the emerging challenges cannot be addressed in isolation and require a coherent effort.

Dr, Mohsin Hafeez, Country Representative, IWMI speaking on the occasion

Speaking on the occasion, UNESCO Country Representative, Ms. Patricia Mc'Phillips said that once a water abundant country, Pakistan has now become a water stressed country. UNESCO, in collaboration with PCRWR has taken initiatives at pilot scale. However, to achieve SDG goal 6 regarding water and sanitation, immense efforts are required amidst the emerging issues of climate change and unregulated exploitation of groundwater. Speakers from various national and international organizations presented their work.

Ms. Patricia McPhilip, Director UNESCO expressing her views

Group photo of the conference participants

Consultation on

Demonstration of Nature Based Solutions for Improving the Resilience of Groundwater Aquifers in Islamabad Capital Territory

Islamabad

The average annual rainfall in Islamabad is about 1.3 m whereas; groundwater depletion is about 1 m annually. There is need to develop nature-based solutions for resilient groundwater aquifers.

Pakistan Council of Research in Water Resources (PCRWR) in partnership with IWMI and WaterAid, conducted a consultative meeting on "Demonstration of Nature based solutions for Improving the Resilience of Groundwater Aquifers in Islamabad" at PCRWR, Islamabad on 14th October, 2021. The consultative meeting was focused to discuss nature based solutions to increase resilience of groundwater aquifer of Islamabad.

Photo of the guests of the event

Dr. Muhammad Ashraf, Chairman, PCRWR said that population increase has widened the demand and supply gap and put groundwater aquifer in Islamabad under immense stress. Moreover, the urbanization has further aggravated the situation by increasing runoff which was causing flooding at the downstream areas of Rawalpindi. He informed that PCRWR has signed an MoU with Capital Development Authority (CDA) for the implementation of various initiatives including the development of 100 rainwater harvesting sites to increase groundwater recharge in this context.

Syed Munawar Shah, Member Engineering CDA briefing on the initiatives

Dr. Mohsin Hafeez, Country Representative IWMI stressed that evidence-based research and nature-based solutions are critically important to solve the prevailing water challenges.

Mr. Ali Nawaz Awan, Special Assistant to PM on CDA expressing his views

The chief guest, Mr. Ali Nawaz Awan, Special Assistant to Prime Minister on CDA affairs highlighted the initiative of the government to manage water supply and shared progress on additional surface water supply of 100 million gallon/day to Islamabad from Ghazi Barotha. Moreover, he emphasized the need to have a better water resource planning by setting medium and long-term goals. Furthermore, he stressed the need to harvest the maximum potential of available rainwater by developing 400-500 recharging sites in the next two years to increase aquifer resilience and manage water scarcity challenges.

Group photo of participants, organizers, researchers and representatives of stakeholder organizations

Representation in

4th Extraordinary Session of the Intergovernmental Council of the Intergovernmental Hydrological Program (IHP)

The 4th Extraordinary session of the Intergovernmental Council of the Intergovernmental Hydrological Program (IHP) was conducted from 29th September to 1st October 2021. Dr. Muhammad Ashraf, Chairman, PCRWR and Faizan ul Hasan, Secretary, PCRWR participated in the meeting on behalf of Pakistan. The meeting was held in UNESCO Headquarters, Paris while all member countries participated online due to COVID-19. It is worthwhile mentioning here that PCRWR is the Secretariat of Pakistan National Committee on Intergovernmental Hydrological Program of UNESCO.

Consultation on

Groundwater Legislation for Islamabad

Islamabad

Groundwater of Islamabad is depleting at rate of 1 meter annually whereas, the population of the city is growing at a rate of 5.7 percent per year aggravating the water shortage. Scarcity of water especially the potable water has remained a major issue.

Pakistan Council of Research in Water Resources (PCRWR) in collaboration with WaterAid, Pakistan organized a consultative meeting on 13th January 2022 at PCRWR headquarter, Islamabad, for the review of first draft on "Ground water Regulatory Framework" for Islamabad Capital Territory (ICT). This draft was developed in collaboration with WaterAid and their legal consultants Musawi, Pakistan. The representatives from various organizations from Government departments, WaterAid, WHO, UNICEF, World Bank and UNESCO Pakistan attended the meeting.

Addressing the participants Dr. Muhammad Ashraf, Chairman, PCRWR stressed upon the need for development of a groundwater regulation in the light of emerging issues in water sector like water demand and supply gap in Pakistan especially in ICT.

The water resource assessment of ICT was presented by Dr. Naveed Iqbal, Director Hydrology (PCRWR) and the draft paper on groundwater legislations was presented by Ms. Fatima Bukhari, Chief Executive officer of Musawi, Pakistan. Consultative discussion was carried out by participants of various organizations from technical to legal aspects and it was agreed upon that public engagement at all steps of the legislative formulation is essential. It was also strongly voiced that there must be a mechanism for implementation of the law in letter and spirit based on accountability.

Photo of the guests of the event

National Workshop on

Customized Irrigation and Climate Advisory Service (ICAS)

Islamabad

PCRWR is providing irrigation advisory services based on scientific data to 20,000 farmers on weekly basis. The advisory service has enabled farmers to know that when to and how much to irrigate. The farmers were previously going on instincts and over irrigating their crops.

Pakistan Council of Research in Water Resources (PCRWR) organized a National Workshop on Customized Irrigation and Climate Advisory Service (ICAS) in collaboration with the Asian Disaster Preparedness Centre (ADPC) on 24th May, 2022 in Islamabad. The objective of the workshop was to bring together all the stakeholder organizations, individuals, researchers and "Citizen Scientists" working in the field of natural resource management for building resilience to climate change, agriculture and water productivity.

Speaking on the occasion, Chief guest Dr. Kazim Niaz, Secretary, Ministry of Water Resources remarked that climate change was an emerging challenge to the water resources of Pakistan that demands rapid participatory actions. He appreciated the efforts made by PCRWR to engage farmers as "Citizen Scientists" in bringing, up innovative solutions for natural resource management and resilience to climate change. Dr. Aslam Perwaiz, Deputy Executive Director, ADPC highlighted that locally steered innovative solutions were key to building solutions for climate resilience.

In his address, Dr. Muhammad Ashraf, Chairman, PCRWR stressed that it was essential to convey irrigation scheduling information to farmers to avoid crisis situations in irrigated agriculture. In his keynote speech, Professor Faisal Hossain, University of Washington, USA remarked that there was a huge potential to utilize scientific data for the benefit of a common person.

Group photo of workshop participants with chief guest Dr. Kazim Niaz, Secretary, MoWR

Launching of

IWRM Implementation Guidelines for Pakistan

and

UN World Water Development Report 2021

Integrated Water Resources Management (IWRM) is a process that promotes the coordinated development and management of water, land and related resources in order to maximize economic and social welfare in an equitable manner without compromising the sustainability of vital ecosystems.

Islamabad

Pakistan Council of Research in Water Resources (PCRWR) in partnership with UNESCO Islamabad launched two reports; (i) IWRM Implementation Guidelines for Pakistan and (ii) UN World Water Development Report 2021. PCRWR developed an IWRM implementation guideline for Pakistan which will be a guiding document for all stakeholders working at federal and provincial levels. The World Water Development Report 2021 was focused on the theme of "Valuing Water".

Ms. Patricia Mc'Phillips, UNESCO Country Director, stated that the rising population and increasing impact of climate change have put Pakistan under immense stress. In this context, Integrated Water Resources Management (IWRM) is an effective approach to manage water resources with science and policy.

Dr. Mohsin Hafeez, Country Representative IWMI, Mr. Ahmad Kamal, Chairman, Federal Flood Commission and Dr. Muhammad Ashraf, Chairman (PCRWR) were the key note speakers of the event.

Photo of the guests of the event

Launching of

National Water Quality Monitoring Program Report (2020-21)

Islamabad

Water is a vital resource for human survival. Safe drinking water is a basic need for good health and it is also a basic human right.

PCRWR leads a National Water Quality Monitoring Program (NWQMP) to assess the status of water quality in Pakistan. National Water Quality Monitoring Program Report (2020-21) was launched by PCRWR on October 20, 2021. Dr. Muhammad Ashraf, Chairman PCRWR, gave an overview of Pakistan's water challenges and required measures. He highlighted the issues related to water supply, management, governance and emphasized to address these through policy measures, capacity enhancement and by introducing the concept of service delivery in water sector.

The Chief Guest, Federal Secretary Science and Technology, Dr. Akhtar Nazir in his opening remarks mentioned that Ministry of Science and Technology through PCRWR is committed to provide technical assistance to the nation regarding status of Safe Drinking Water in the country. Dr. Hifza Rasheed, D.G (Water Quality) PCRWR presented the findings of the report on the current status of the drinking water quality in 29 cities, causes of slow paced improvement and the way forward.

Glimpse of the launching ceremony of NWQMP Report 2020-21 at Islamabad

Another launching ceremony of the Report was held at PCRWR Regional Office, Lahore on December 24, 2021. The report was launched by Dr. Shakeel Khan, Chairman, Punjab Aab-e-Pak Authority.

Glimpse of launching ceremony at Lahore

National Consultation on

Groundwater Governance in Pakistan

Islamabad

Groundwater supplies 90 percent of domestic water in rural areas of Pakistan, 70 percent of domestic water nationally and over 50 percent of agricultural water. About 1.2 million tube wells are extracting 50 million acre feet of water every year for farm irrigation.

Pakistan is among the places worst affected by rapid depletion of groundwater. Therefore, improving groundwater management is integral to Pakistan's economic development.

A one-day consultative meeting was jointly organized by PCRWR and WaterAid on 24th February, 2022 at Marriott Hotel, Islamabad. The meeting was aimed to consult with policy makers and civil society for their feedback to bridge the policy implementation gaps within existing legislative framework. This meeting was conducted as part of activities being implemented by PCRWR under program of cooperation (PoC) signed with CDA in July, 2021.

Under this PoC, a number of initiatives are under implementation where PCRWR in collaboration with other partner institutions to manage water challenges in ICT. The development of groundwater regulatory framework is one of important initiatives under this PoC where PCRWR is providing technical assistance and WaterAid-Pakistan is covering legal aspects through MUSAWI-Pakistan for sustainable water resource management.

Glimpses of the event

Workshop on

Water Resources Challenge in Azad Jammu and Kashmir

Muzaffarabad

Major challenges faced by water resources of the country are at surface water resources, pollution from surface sources, inadequate quality for domestic uses, shortage and scarcity of recharge. The groundwater resources receive limited recharge and are generally suffering from scarcity, depletion and declining groundwater levels.

PCRWR in collaboration with Islamic Relief organized a state-level workshop on water resources challenges in Azad Jammu and Kashmir in Muzaffarabad on 23rd June, 2022. The workshop was chaired by Mr. Khwaja Farooq Ahmed, Minister for LG&RD Govt. of AJ&K. Dr. Hifza Rasheed, Director General (WQ), PCRWR presented an overview of the water challenges in Pakistan including AJ&K. Participants from stakeholder organizations i.e., govt. departments, UN agencies, academia and private organizations working in the water sector in AJ&K participated in the workshop.

During panel discussion session, it was highlighted that there is an immense need to address prevailing issues such as water shortage, unsafe water quality and disposal of untreated wastewater in Neelam-Jhelum Rivers. Participants stressed on the water quality profiling and developing solutions to address these challenges in AJ&K. It was also emphasized that there is dire need to develop decentralized wastewater treatment facilities to restore ecosystem health. Dr. Hifza Rasheed also highlighted the need of approval and implementation of AJ&K water policy as well as development of AJ&K Water Act with defined roles and responsibilities of different agencies in AJ&K.

A Letter of Intent between PCRWR and Islamic Relief was signed to work jointly on addressing water challenges faced across the country including AJ&K. At the end, Country Director, Islamic Relief, Mr Raza Narejo and the Minister for AJ&K LG&RD, Mr. Khwaja Farooq Ahmed concluded the workshop with the commitment to take initiatives as highlighted by the panelists and the participants.

Group photo of the workshop participants

Water is at the center of economic and social development. It is vital to maintain health, grow food, generate energy, manage the environment and create jobs. It touches every aspect of development and it links with nearly every Sustainable Development Goal (SDG). It drives economic growth, supports healthy ecosystems and is essential and fundamental for life itself.

2nd International High-Level Conference on

International Decade for Action "Water for Sustainable Development, 2018-2028"

Dushanbe-Tajikistan

PCRWR professionals participated in two side events at the 2nd International Conference on International Decade for Action 2018-2028 at Dushanbe, Tajikistan. In side event, "Building Evidence for Water-related Policy Making: The SDG 6 Policy Support System (SDG-PSS)" organized by the United Nations Office for Sustainable Development, PCRWR team presented its learning experiences of using SDG 6.0 Policy Support System. The Chairman, PCRWR, Dr. Muhammad Ashraf was among the eminent panelists in the second side event organized by International Water Management Institute (IWMI), Science and evidence-based solutions to improve transboundary water cooperation in small transboundary tributaries of the Central Asia were presented.

Photo of event panelists

Capacity Building on Water Quality Monitoring and SDG 6

UNOPS in collaboration with PCRWR, MoCC, KOICA and PHED organized formal launching ceremony of the ongoing project "Capacity Building on Water Quality Monitoring and SDG 6 (6.1) Reporting" on March 29, 2022. Dr. Hifza Rasheed, D.G. (Water Quality) PCRWR briefed about role of PCRWR on capacity building and water quality monitoring activities of this project.

International

Conference on Climate Change: Impacts and Responses

Karachi

Pakistan is highly vulnerable to climate change due to its geographic location, high dependence on agriculture and water resources, low adaptive capacity of its people and weak system of emergency preparedness.

A comprehensive and coordinated climate change response road map is required to minimize its impacts.

PCRWR Regional Office Karachi organized International Conference on Climate Change: Impacts and Responses from 8-9 March, 2022 at ICCBS, University of Karachi. The conference was organized in collaboration with Society of Economic Geologists & Mineral Technologists (SEGMITE), Department of Geology, University of Karachi, Pakistan Science Foundation (PSF) and Pakistan Metrological Department (PMD). Forty-Five (45) papers were presented in the conference out of which thirty-seven (37) papers were presented from academia, research and development organizations, policy makers from all over the Pakistan and eight were presented online from USA, Bangladesh, Nepal, Sri Lanka, Turkey and Iran. Director General, PCRWR – Islamabad participated in the conference as Keynote speaker.

A glimpse of the event

Workshops on

Salinity Policy Review

Tandojam

High concentration of salts (salinity) is dangerous for soil health and soil biota. In Pakistan, more than 6.3 million hectares have been damaged by salinity.

Pakistan depends on agriculture for foreign exchange earnings and almost half of the population is linked with the agriculture sector. In the case of salinity, the land becomes useless as it cannot be used for irrigation and growing crops. The issue of salinity is also posing threats to food security in Pakistan.

PCRWR has undertaken a policy review in partnership with Mehran University of Engineering and Technology under a project "Adapting to salinity in the Southern Indus Basin project". This project is led by Charles Stuart University with the financial support of Australian Centre for International Agricultural Research (ACIAR).

On 17th March and 12th May, 2022 PCRWR and Mehran University of Engineering and Technology organized workshops in Karachi and Islamabad to gain the insight of stakeholders on the recommendations presented by PCRWR. These workshops were participated by a number of stakeholders, national and international experts including; WWF, USPCAS-W, MUET, Sindh Irrigation Department, SIDA, WWF, IUCN, FAO, WAPDA, Department of Agricultural Research, Sindh Abadgar Board, ICBA, CSU and members of farming community.

Group photo of workshop participants

2nd Meeting on

Upper Indus Basin Network (UIBN) – Pakistan Chapter Responses

Islamabad

The Upper Indus Basin Network (UIBN) is a voluntary informal knowledge and research network of national and international researchers working in the basin. It aims to foster coordination in research related to climate, cryosphere, water, hazards and vulnerability, and adaptation.

On January 11, 2022, ICIMOD and Pakistan Council of Research in Water Resources (PCRWR) jointly organized 2nd meeting of Upper Indus Basin Network (UIBN) Pakistan Chapter on January 11, 2022 in Islamabad. Members from many national and international organizations, including NGO's attended the meeting. The technical working groups (TWG) on six different thematic areas presented progress of their respective group. All participants appreciated the leading role of Director General Pakistan Meteorological Department (PMD) as outgoing Country Coordinator of Upper Indus Basin Network (UIBN)-Pakistan Chapter. Dr. Muhammad Ashraf, Chairman PCRWR, was elected as the new Country Coordinator of Upper Indus Basin Network (UIBN) Pakistan Chapter.

A glimpse of the event

Meeting on

Pakistan National Committee on Intergovernmental Hydrological Program

Islamabad

The UNESCO Intergovernmental Hydrological Program (IHP) is the only intergovernmental cooperation program of the UN dedicated to water research and management, and related education and capacity development.

PCRWR is the secretariat of Pakistan National Committee on Intergovernmental Hydrological Program (PNC-IHP)

PCRWR in partnership with UNESCO organized the Intergovernmental Hydrological Program (IHP) meeting at PCRWR, Islamabad on 6th October 2021. In this regard, representatives from Provincial Irrigation Departments, Centre of Excellence of Water Resources Engineering, WAPDA, Pakistan Meteorological Department and Federal flood Commission attended the meeting. All the organizations presented their progress during eighth phase as member of IHP committee.

photo of workshop participants

Karezes have been the main source of water for drinking and irrigation purposes for the poor community living in the command areas. However, karez system has faced great challenges over the last few decades such as drying up, abandonment and damage.

PCRWR has pledged for conservation of Karezes by undertaking rehabilitation activities for sustainability and wide scale dissemination as world heritage.

A Steering Committee comprising of all the stakeholders have been constituted in this regard.

Meetings of the Steering Committee on

Nomination of Karez Cultural Landscape of Balochistan in the World Heritage List

Quetta-4th Meeting

The 4th Steering Committee meeting was held on 29th July, 2021 under the chairmanship of Secretary, Planning & Development (P&D) Department, Government of Balochistan. The main agenda was to review the progress on cultural mapping process for the possible nomination of Karez System Cultural Landscape. The meeting was attended by the Country Director UNESCO Pakistan, Chairman PCRWR, and representatives of steering committee member organizations. The Secretary, PCRWR, presented an updated progress on the Karez Cultural Landscape potential nomination process.

Group photo of participant at 4th meeting

Islamabad- 5th Meeting

The 5th meeting of steering committee was held at PCRWR, Headquarters, Islamabad on 1st December, 2021. Dr. Muhammad Ashraf, Chairman, PCRWR welcomed the guests and briefed about the agenda of the meeting and the importance of the Karez System for the Balochistan.

Ms. Patricia Mc Phillips, Country Director, UNESCO appreciated the work of PCRWR and emphasized the importance of rehabilitation of Karez System for the sustainable agriculture and water resources for Balochistan. Mr. Muhammad Asgher Arifal, Secretary Culture and Tourism Balochistan, on behalf of Additional Chief Secretary Balochistan chaired the meeting and highlighted cultural and potential tourism sites in the Balochistan. Representative from UNESCO also briefed the participants about the process of nomination of Karez cultural landscape of Balochistan in World Heritage list.

Group photo of participant at 5th meeting

Media Briefing on

Artificial Groundwater Recharge Site at Kachnar park, Islamabad

Islamabad

Artificial groundwater recharge is the infiltration of surface water into shallow aquifers to increase the quantity of water stored in the subsurface and to improve its quality by processes of natural attenuation.

Groundwater resources of Islamabad are under great stress due to rapid urbanization, and excessive groundwater pumping.

On the other hand surface water sources e.g. rainwater is drained unaccounted into rivers.

International Water Management Institute (IWMI), PCRWR and WaterAid Pakistan jointly organized a media briefing to highlight the artificial groundwater recharge site at Kachnar park, Islamabad on 24th June, 2022. The site was developed by IWMI and PCRWR under a project, funded by WaterAid, Pakistan. Dr. Mohsin Hafeez, Country Representative, IWMI gave the welcome remarks and urged the media representatives to highlight water challenges in Islamabad.

Dr. Muhammad Ashraf, Chairman, PCRWR, highlighted that solution to the water supply challenge was linked with rainwater harvesting. He said that the annual average rainfall in Islamabad was about 1.3 m whereas, groundwater depletion is about 1 m annually. It means that if we conserve the available rainwater potential efficiently through recharge, we could easily manage the demand and supply gap.

Mr. Muhammad Yahya Akhunzada, Joint Secretary (Admin), Ministry of Water Resources, urged the media to sensitize public on rainwater harvesting for watering plants and conserving water resources at large. Rana Shakeel Asghar, Member (Finance), Capital Development Authority (CDA), appreciated the efforts of IWMI, PCRWR and WaterAid Pakistan in piloting the initiative and hoped that it will help to recharge groundwater. He informed that 100 groundwater recharge sites are being constructed by CDA in collaboration with PCRWR in Islamabad.

Mr. Arif Jabbar Khan, Country Director, WaterAid Pakistan said that Pakistan is faced with challenges related to drinking water, both in terms of quality and quantity. Piloting and testing sustainable models that can be replicated by the public and private sectors is a key objective of WaterAid.

Glimpse of the media briefing event

One Day Training Workshop on

Best practices for Drinking Water Quality Management

Pakistan ranks at number 80 among 122 nations regarding drinking water quality. Drinking water sources, both surface and groundwater are contaminated with coliforms, toxic metals and pesticides throughout the country.

Microbial and chemical pollutants are the main factors responsible exclusively or in combination for various public health problems.

There is a need to adopt best practices to manage drinking water quality.

Islamabad

PCRWR in collaboration with Institute of Management Sciences (IM-Sciences), HEC and World Bank Group organized a one-day training workshop on "Best Practices for Drinking Water Quality Management" to achieve the Sustainable Development Goal 6 on 17th February, 2022 at Islamabad.

Dr. Muhammad Ashraf, Chairman PCRWR shared an overview of water challenges in Pakistan. He also emphasized that investment on skilled human resource development is more important than infrastructure and equipment for sustainable operation of water supply. Dr. Hameed Jamali, Assistant Professor Institute of Management Sciences (IM-Sciences), Peshawar and Principal Investigator of the project "Sustainable Development Goal 6: Inclusive Governance of Urban Water and Sanitation", delivered opening remarks. He briefly introduced the project and shared water challenges in Khyber Pakhtunkhwa.

The inaugural session was followed by a technical session and demonstration session. Dr. Hameed Jamali and Dr. Hifza Rasheed, DG, WQ PCRWR concluded the event by distributing certificates among the professionals. This training was attended by 14 professionals of WatSam, Water Supply Schemes of Pakistan, (WSSP) and Public Health Engineering Department (PHED) of Khyber Pakhtunkhwa.

Glimpse of the event

4th Meeting of

PEC Think Tank on Water Resources Development

PEC constituted Think Tank Committee comprising of eminent engineers to assist in formulation of relevant policies relating to national development. The meeting of PEC Think Tank Committee on Water Resources Development was arranged at PCRWR to discuss upcoming Seminar on groundwater in Pakistan: "Making Invisible to Visible".

Islamabad

PCRWR hosted 4th meeting of Pakistan Engineering Council Think Tank committee at PCRWR headquarters, Islamabad on 24th February, 2022. The meeting was chaired by Engr. Raghib Abbas Shah Convener; PEC Think Tank committee. The main agenda of the meeting was deliberations on upcoming seminar on groundwater in Pakistan: "Making Invisible to Visible".

Dr. Muhammad Ashraf, Chairman, PCRWR welcomed the guests and gave a detailed presentation on the mandate, major areas of research of the PCRWR. He elaborated the significant impacts of PCRWR's research activities in the field of irrigation and drainage, soil reclamation, drinking water, wastewater management, rainwater harvesting and artificial recharge of groundwater. He also briefed about the different ongoing projects (PSDP & Donor funded) of PCRWR.

Afterwards, the delegation visited the different pilot interventions like recharge well, soak way, rooftop rainwater harvesting etc. developed in the office premises of PCRWR. They also visited the soil physics and national water quality lab of PCRWR. The participants appreciated the work and initiatives of PCRWR to address the water issues faced by the country. The convener of the committee expressed that the work of PCRWR is very productive and will be helpful to attain sustainability in the water sector.

Group photo of meeting participant

Technical Workshop on

Indus Telemetry Installed in Khyber Pakhtunkhwa

Indus Telemetry is a collaborative research partnership of the PCRWR and the International Water Management Institute with the support of the Ministry of Water Resources, the Indus River System Authority and all four provincial irrigation departments.

The installation of automated Telemetry System at different canals and barrages of the country will help reduce the mistrust among different provinces in terms of water distribution through providing data.

Peshawar

Pakistan Council of Research in Water Resources (PCRWR) and Irrigation Department Government of Khyber Pakhtunkhwa in collaboration with International Water Management Institute (IWMI) organized a review meeting on 9th November, 2021 in Peshawar. Dr. Naveed Iqbal, Director, PCRWR highlighted the importance of the telemetric system and its auto data acquisition. He briefly explained the beginning work of IWMI on the telemetric system in Pakistan. He also added that how this technology can play role in eliminating the mistrust between the provinces.

Chief Engineer (North) Nasir Ghafoor Khan appreciated the efforts of IMWI and PCRWR for supporting in telemetric sophisticated technology. He added that it is the need of the day to shift from manual system to technological system.

Dr. Tausif Bhatti, representative, IWMI Pakistan, explained in detail the components of the telemetric system, its working principles, transfer and saving of important data. Different rating curves are developed for each canal in the Khyber Pakhtunkhwa province, accordingly, real-time data is coming on the server and then communicated to the irrigation department through WhatsApp messages as well as displaying on the screens in their head offices. In order to validate the accuracy of telemetric system, the data is cross-checked with Acoustic Doppler Current Profiler (ADCP) used for channel flow measurement.

Group photo of workshop participants

PCRWR Won

"Best Water Solution Award" in World Water City Forum 2021

World Water Cities Forum is an exclusive platform for city leaders and water experts to discuss water-related issues and solutions for each city and share best practices and policies related to water management. It is a forum for discussing the way to utilize water management and water technology/ water industry development as a tool for creating attractive, livable, resilient and prosperous city.

Daego- Korea

PCRWR participated in World Water City Forum (WWCF-2021) and represented Jhelum City, Pakistan from 30th November to 1st December 2021 at Daegu, Korea. The event was held in hybrid mode where a large number of water professionals and practitioners participated both physically as well as online. During this event, the solution for two cities (Mikeli-Finland, Shaoxing-China) were announced from the member cities related to water challenges.

PCRWR team under the leadership of Dr. Muhammad Ashraf, Chairman suggested solution for Shaoxing city, China on the topic, “Seeking comprehensive and innovative strategies for the management and restoration of plain river ecology”. For Shaoxing, there were four solutions presented by relevant professionals of four countries including Pakistan.

In this challenge, Dr. Naveed Iqbal, Director (Hydrology), PCRWR proposed technological sound and practical viable nature-based solutions for sustainable water resources management. The team of four judges consisting of renowned water experts declared PCRWR team winner and awarded “Best Water Solution Award”. Being chair of the session, Mr. Known Young-Jin, mayor of Daegu, Korea extended appreciation letter to PCRWR professional and showed keen interest for future collaborative initiatives.

Group photo of representatives participated virtually and physically

Participation in

Climate Innovation Challenge of Asian Disaster Preparedness Centre

The Climate Innovation Challenge (CIC) aims to crowdsource innovative and disruptive technology solutions from around the world for resilience in South Asia.

Islamabad

Asian Disaster Preparedness Centre (ADPC) announced Climate Innovation Challenge internationally targeted to invite pilot solutions. PCRWR's proposed solution, “Customized Irrigation and Climate Advisory Service through Citizen Science” is one of 16 finalists out of 238 applicants. PCRWR implemented this pilot solution for climate data analytics with in a period of 6 months.

PCRWR Joins

Comstech Consortium of Excellence

COMSTECH the Ministerial Standing Committee on Scientific and Technological Cooperation of the OIC (Organization of Islamic Cooperation) was established by the Third Islamic Summit of OIC held at Makkah, Saudi Arabia in January 1981. The President of Pakistan is Chairman of COMSTECH.

Islamabad

The OIC Ministerial Standing Committee on Scientific and Technological Cooperation (COMSTECH) launched the “COMSTECH Consortium of Excellence (CCoE)” comprising of leading academic and research institutions of Pakistan and OIC member states in the fields of Science, Technology, Engineering and Mathematics. CCoE initiative was conceived to provide the platform to the leading universities and research institutions of Pakistan and the universities/institutions of the OIC member states to cooperate, collaborate and showcase their achievements. Currently, 23 universities and research institutions have joined CCoE.

Pakistan Council of Research in Water Resources (PCRWR) also joins COMSTECH Consortium of Excellence (CCoE). PCRWR assured tireless support and collaboration to COMSTECH initiatives for the promotion of collaboration among OIC countries in Science and Technology.

Collaborations

Program of Cooperation with

CDA and FGEHA for Resolving Water Issues in Islamabad

Islamabad

PCRWR has signed a Program of Cooperation (PoC) with Capital Development Authority (CDA) on 8th July, 2021 and with Federal Government Employees Housing Authority (FGEHA) on 22nd September, 2021. PCRWR will provide technical assistance to CDA and FGEHA for resolving water issues in Islamabad. The focus of these PoCs was water conservation, development of groundwater regulatory framework and mass awareness.

The activities include enhancing groundwater recharge and establishment of monitoring network, complete ground water resource assessment and development of automatic system for the estimation of system losses for managing demand and supply gap, formulation of groundwater regulatory framework, Water quality monitoring and analysis of surface water, wastewater and wastewater re-cycling for multiple uses.

Signing ceremony of PoC between PCRWR and FGEHA

Agreement of Cooperation between

PCRWR and Fatima Jinnah Woman University, Rawapindi

Islamabad

An Agreement of Cooperation (AoC) was signed between PCRWR and Fatima Jinnah Woman University, Rawalpindi at PCRWR headquarters, Islamabad on 26th April, 2022. The AoC was intended to build close cooperation to broaden the research domains in the area of environmental sciences. The institutions agreed to collaborate on different projects and initiative aimed to create awareness related to water management, rain water harvesting, WASH, water quality and water security. It was also agreed to collaborate in research for submitting joint proposals and publications in the field of water management and water quality.

Dr. Saima Hamid, Vice Chancellor, FJWU, showed her keen interest to engage the students of FJWU to learn about the different interventions of PCRWR in the water sector. Dr. Muhammad Ashraf, Chairman PCRWR, said that this cooperation will be fruitful for the future of the country as the students will get a chance to extend their learnings by taking part in different collaborative projects/ publications with PCRWR.

Agreement between

PCRWR and BIDR, China

Islamabad

Pakistan Council of Research in Water Resources (PCRWR) signed a Strategic Cooperation Agreement (SCA) with China Water Resources, Beifang Investigation, Design and Research Co. Ltd. (BIDR) on 9th March, 2022. The key feature of this collaboration is to extend mutual collaboration for the exchange of knowledge, technical expertise and transfer of technologies in the field of water resources management. Lt. Gen. Muhammad Afzal (Retd.) Chairman, Warm Waters Advisory Group (WWAG) remarked that this agreement will bring opportunities PCRWR to address water sector issues in Pakistan. Dr. Muhammad Ashraf, Chairman, PCRWR apprised that this joint agreement would crystallize the impact of PCRWR's research and development activities in line with the expertise of BIDR for strengthening water resources management in Pakistan. Mr. Yu Yusen, General Manager, BIDR joined the meeting online and highly acknowledged the significant contribution of PCRWR, Ministry of Science & Technology. He also provided that under the largest investment of CPEC in Pakistan, BIDR is committed to facilitate the Government of Pakistan for water sect evelopment.

Signing ceremony of SCA between PCRWR and BIDR, China

Collaborative Agreement Signed between

PCRWR and AquAffirm Ltd. UK

Islamabad

A collaborative agreement was signed between PCRWR and AquAffirm Ltd. UK on 20th June, 2022. Dr. Muhammad Ashraf Chairman, PCRWR welcomed AquAffirm team including Dr. David Sarphie, CEO AquAffirm Ltd. and Dr. Hanadi Nixon, Chief Scientist, AquAffirm Ltd. Dr Hifza Rasheed, (D.G) Water Quality briefed about the purpose and deliverables of agreement as to conduct validation of AquAffirm rapid sensor-based testing of arsenic and its real time mapping using Aquasoft software in 13 tehsils of Punjab. Dr. David Sarphie highlighted that this validation would support the activities of the World Bank project “Punjab Rural Sustainable Water Supply and Sanitation Project”. Chairman, PCRWR and Dr. David Sarphei, AquAffirm signed the agreement. Following agreement signing, laboratory and field training on validation activities was undertaken at PCRWR, Islamabad and arsenic affected areas of Lahore and Kasur.

Signing ceremony of agreement between PCRWR and AquaAffirm Ltd. UK

Signing of Letter of Intent between

PCRWR and World Wildlife Fund- Pakistan

Islamabad

A Letter of Intent was signed between Pakistan Council of Research in Water Resources (PCRWR) and the World Wildlife Fund-Pakistan (WWF-Pak) on 18th May, 2022 to support the implementation of Australia-Pakistan Water Security Initiative (APWASI) in Islamabad and Rawalpindi. Under the South Asia Water Security Initiative (SAWASI), APWASI being funded by the Australian Government through Department of Foreign Affairs and Trade (DFAT) includes Water Sensitive Urban Design Demonstration Projects.

Ms. Farah Nadeem, Specialist Liaison & Engagement APWASI shared an overview of the activities to be implemented under this LoI. Mr. Hammad Naqi Khan, DG WWF-Pakistan in his remarks highlighted the partnership background with PCRWR. He appreciated the science based professional approach of PCRWR to address the water challenges. He expected that this partnership would be further strengthened through joint working under APWASI. Afterwards, Dr. Muhammad Ashraf provided an overview of PCRWR initiatives to address water issues of the country. He assured the PCRWR support to WWF-Pakistan for APWASI activities being undertaken in Islamabad and Rawalpindi. After remarks, Letter of Intent was formally signed by Dr. Muhammad Ashraf (Chairman, PCRWR) and Mr. Hammad Naqi Khan (DG, WWF-Pak).

Signing ceremony of LOI between PCRWR and WWF-Pak

Program of Cooperation

PCRWR and SAWiE

Islamabad

A Program of Cooperation (PoC) was signed between PCRWR and Sustainable Agriculture Water and Intelligent Ecosystem (SAWiE) on 18th February, 2022. The objective of the PoC was to establish close cooperation in the field of agriculture water management and to create awareness related to agriculture water management and water quality among farmers.

Signing ceremony of PoC between PCRWR and SAWiE

Program of Cooperation (PoC) between

PCRWR and Centre for Global and Strategic Studies (CGSS)

Islamabad

A Program of Cooperation (PoC) signed between PCRWR and CGSS at PCRWR headquarters, Islamabad on 21st December, 2021. The main objective of the PoC was a close cooperation in the field of nontraditional security challenges related to water. The PoC was signed by Dr. Muhammad Ashraf, Chairman, PCRWR and Mr. Khalid Taimur Akram, Executive Director, Centre for Global and Strategic Studies. The institutions agreed to collaborate on different projects and initiative aimed to create awareness related to water management, rain water harvesting, WASH, water quality and water security.

Dr. Muhammad Ashraf, Chairman PCRWR, said that this cooperation will be fruitful for the stakeholders and country to understand the nontraditional security threats like water security, food security, climate change and variability etc.

Signing of PoC between PCRWR and CGSS

Agreement of Assignment (AoA) Signed Between

PCRWR and Human Appeal

Islamabad

An Agreement of Assignment (AoA) is signed on 14th December, 2021 between Pakistan Council of Research in Water Resources (PCRWR), Islamabad and Human Appeal (HA), Pakistan for a period of two years. The purpose of this AoA is to undertake joint programs on knowledge sharing, technical backstopping, groundwater exploration, water quality monitoring and implementation of water supply and irrigation schemes, drinking water projects related interventions by HA and its partners across Pakistan. Dr. Muhammad Ashraf, Chairman PCRWR and Mr. Daud Saqlain, Country Director, Human Appeal has signed the AoA in the presence of professionals of PCRWR and Human Appeal.

Signing of AoA between PCRWR and Human Appeal

Research and Development Activities

Project 1

PSDP

Rehabilitation and Conservation of Karezes for Sustainable Groundwater Management and Livelihood Improvements in Balochistan

Commencement Date: July, 2021
Completion Date: June, 2024
Status: On-going

Brief Introduction

The current project intends to identify technical, economic and social issues related to Karezes and introduce simple and efficient rehabilitation techniques for sustainable management of Karezes in Balochistan, Pakistan. On the basis of lessons learnt and best management practices in other parts of the region such as Iran, a regulatory framework would be devised for sustainability of karezes. The community participation would be an integral component of project activities.

The overall goal is to improve supply of water for drinking and irrigation in rural areas of the province through rehabilitation and conservation of the traditional Karez water management system.

Objectives:

i. To assess technical, economic and social aspects for rehabilitation and conservation of Karez water system;
ii. To build technical capacity through rehabilitation and maintenance of selected non-functional Karez system; and
iii. To develop networking with concerned institutions in the region to share the information and experience in the traditional water systems.

Highlights of the Year 2021-22:

- Carried out Electrical Resistivity Survey at 02 sites
- Constructed a Leaky Dam in the project area
- Constructed Ditches (07 No.), Check Structures (09 No.), Trenches (71 No.), Eyebrows (19 No.) Bundhats (08 No.)
- Developed 6 No. Inverted Wells
- Carried out cleaning of Karezes 7916 Rft
- About 450 plants have been planted for watershed management

A glimpses of project interventions

Project 2

PSDP

Groundwater Investigation and Mapping in Sindh

Commencement Date: July, 2019
Completion Date: December, 2022
Status: On-going

Brief Introduction

Sindh province is under serious threat to groundwater sustainability due to overexploitation and quality deterioration. The low conveyance efficiency and mismanagement of surface water has compelled the farming community to relay more on groundwater at tail-ends. Resultantly, the accelerated water depletion is not only prominent but also, triggering saline water up-coning which is causing secondary salinization in these areas. It is very important to have a detailed and comprehensive groundwater investigation study for the demarcation of usable groundwater quality of Lower Indus Plain aquifer by focusing on the canal command areas of 14 major canals in Sindh Province.

Objectives:

i. Analyzing spatial variations in depth to water table on seasonal basis (Pre-Moonson and Post-Moonson)
ii. Demarcation of spatial variation in groundwater quality and identification of usable groundwater pockets.
iii. Assessment of canal water discharges and calculation of seepage rate

Highlights of the Year 2021-22:

- Completed the depth to water table measurement on seasonal basis in the 14 command canal area of Sindh Province.
- The Shaheed Benazirabad has maximum depth to water table whereas it is minimum in Kashmore.
- Conducted ERS survey in the command canal areas of Kotri and Guddu barrage whereas the most of the field work has been completed at the Sukkur Barrage.
- Conducted discharge measurement and seepage measurement at Kotri barrage.

Glimpses of groundwater and hydrological Investigations

Project 3

PSDP

Commencement Date: July, 2019
Completion Date: December, 2022
Status: On-going

Monitoring of Sea Water Intrusion, Sea Water Rise, Coastal Erosion and Land Subsidence along Sindh and Balochistan Coast

Brief Introduction

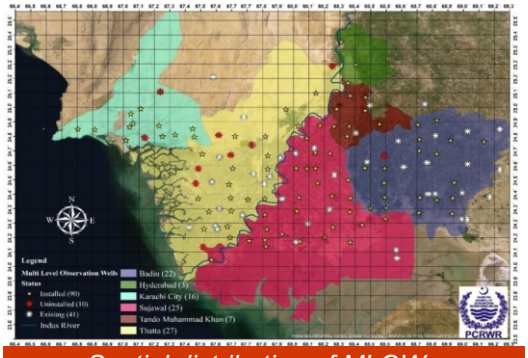
The project consists of four phases to be completed in 05 years. Phase1 i.e., preliminary vulnerability assessment report, having 06 months duration has been completed and has started its Phase 2 i.e., data collection and analysis, having 02 years duration. In this phase, the role of PCRWR is to plan, design and install MLOWs in the Indus delta and conduct coastline resistivity mapping.

Objectives:

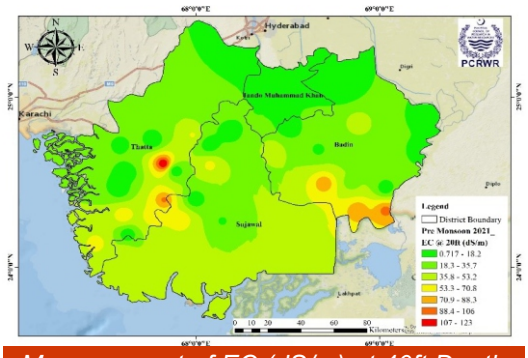
i. To investigate seawater intrusion along the coastal zone of Pakistan through scientific observations to assess the rate of sea level rise and land subsidence.
ii. To find out the causes of erosion through scientific observations and relevant data for assessing its impacts on coastal areas.
iii. To develop a mitigation strategy for countering seawater intrusion and coastal erosion.

Highlights of the Year 2021-22:

- A total of 95 multilevel observation wells (MLOWs) are installed in coastal districts of Sindh province including; Karachi, Thatta, Hyderabad, Tando Muhammad Khan, Badin, Sujawal.
- About 1945 samples are collected from these MLOWs and analyzed for electrical conductivity (EC) and pH to determine the spatial and temporal variation in salinity.
- Soil textural and chemical analysis was performed on 700 samples.



Spatial distribution of MLOWs



Measurement of EC (dS/m) at 40ft Depth

Project 4

Collaborative Project
Pakistan Science Foundation

Exploring Potential of Saline Agriculture and Fish Farming at the Foothills of Salt Range Using Saline Groundwater

Commencement Date: July, 2021
Completion Date: June, 2023
Status: On-going

Brief Introduction

The waterlogging and salinity are the environmental challenges, which cause degradation of productive land resources by decreasing the agricultural productivity. Due to the presence of salt mine, the groundwater is highly saline (EC >81 dS/m, at about 60 m depth) in the surrounding of Khewra and Pind Dadan Khan areas of Jhelum district. This is low-lying area where poor drainage is also a big challenge because of marginal slope. The land is mostly barren and rain-fed agricultural activities are on limited scale. To enhance the farming livelihood and utilize the available land and water resource effectively, the exploration and demonstration of alternate options such as saline agriculture and saline fish farming are very crucial.

Objectives:

i. To increase land and water productivity by developing pilot site for land reclamation through surface drainage and title drainage techniques.
ii. To conduct research on alternative options of saline agriculture & saline fish farming and demonstrate feasible options to enhance farming livelihood in saline groundwater and waterlogged areas.

Highlights of the Year 2021-22:

- Identified the project site and signed agreement with farmer for the development of various project activities.
- Installed solar system along with drilling of bore for irrigation purpose.
- Tensiometer and full stop was installed for soil moisture and nutrient management.
- The farm was established for cereal and cash crop for trial purposes by assessing the soil and water conditions. The saline agriculture crop were grown accordingly. The trial remained successful by sowing different varieties of wheat (dilkash & subhani) during Rabi season.
- Different varieties of wheat crop was grown on 2 acres. The dilkash variety of wheat crop gave yield of about 13 monds whereas, subhani variety of wheat crop gave yield of about 7 monds. The canola crop was grown on 1.25 acres and it gave yield of about 1.62 mounds.
- The design of saline fish farm has been finalized in coordination with Fisheries Development Board and the development phase will be completed by July, 2022.

Project 5

Rainwater Harvesting For Groundwater Recharge in Islamabad

Collaborative Project
Capital Development Authority

Commencement Date: July, 2021
Completion Date: June, 2023
Status: On-going

Brief Introduction

Scarcity of potable water in Islamabad has emerged as one of the major urban issues being confronted by the Capital Development Authority (CDA). The sources of potable water supply of Islamabad are limited however, the population is increasing at a rapid pace resulting in widening the demand & supply gap. PCRWR and Capital Department Authority (CDA) agreed to collaborate and signed a Program of Cooperation to cope the issue by installing groundwater recharge sites in Islamabad.

Objectives:

i. Establishment of 100 sites for rain water harvesting sites to enhance groundwater recharge.
ii. Establishment of 20 sites for the monitoring of groundwater network.

Highlights of the Year 2021-22:

- Identified 97 potential sites for rainwater harvesting through reconnaissance survey.
- Designed 97 rainwater harvesting sites and provided to CDA for further development.
- Conducted 97 electrical resistivity survey probes in sector I, H, G and F for the identification of feasible site pertaining to rainwater harvesting for groundwater recharge in Islamabad.
- Completed fifteen rainwater harvesting sites in all aspects located at Park infront of PCRWR (1 No), AIOU sites (3 Nos), Park near SNGPL office (2 Nos), Park infront of Judicial Academy (2 Nos), green belt along Agha Shahi Avenue by CDA(1 No), Christian Graveyard, H-9 (1 No), Near Lahore Grammar School (1 No), Cricket Ground, I-9 (1 No), Park near St No. 23, I-10 (1 No), Near CDA TW No. 85 St No. 4 (1 No), St No. 105, I-8 (1 No).
- Completed development work of piezometer at 5 sites located at H-8 (2 Nos), I-8, F-9 and F-11 by CDA.
- As an impact of rainwater harvesting project, it is estimated that about 2.4 million gallons of water has been recharged through 06 sites during the rainfall event of January- June, 2022.

Project 6

Collaborative Project

Asian Disaster Preparedness Centre through Climate Innovation Grant Challenge

Commencement Date: January, 2022
Completion Date: July, 2022
Status: Completed

Customized Irrigation and Climate Advisory Services Through Citizen Science

Brief Introduction

The project will help in irrigation and climate advisory, that will offer better forecast for farmers living in Multan, Bahawalpur and Tando Allah Yar It will also help in canal irrigated areas to become water and climate smart.

Objectives:

i. Farmers using Irrigation and Climate Advisory service building climate-resilient farming communities.
ii. Farmers are able to send climate information and in return receive better advisory through an automated system supported by Artificial Intelligence and Algorithms.

Highlights of the Year 2021-22:

- Identification of Citizen Scientists.
- A national stakeholders consultation workshop was arranged.
- Data collected through mobile phones and managed for irrigation advisory.
- Provided trainings to framers “Citizen Scientists” for collecting weather data.

Project farmer in Bahawalpur telling about his rain gauge being used in the project

PCRWR team collection feedback from farmers in their field

A hub farmer running a farmer's "baithak" on ICAS

Study 1

Regular Research Study

Commencement Date: November, 2021
Completion Date: March, 2022
Status: Continuous

Effect of Conjunctive Use of Saline Ground Water and Fresh Rainwater on Growth of Various Fruit, Fuel and Medicinal Plants in Cholistan Desert

Brief Introduction

This study is being conducted at Field Research Station Dingarh in Cholistan desert. Tree plantation of various species of exotic and indigenous plants at research site has been carried out. Experiment to grow mustard crop has also been carried out under saline agriculture.

Objectives:

i. To utilize desert barren land for growing arid and salt tolerant fruit, medicinal and fuel trees and
ii. To produce fruits/ fodder and timber under conjunctive use of saline and fresh rainwater.

Highlights of the Year 2021-22:

- About 1.2 acre barren desert land at Field Research Station Dingarh was brought under cultivation of mustard crop in Rabi Season 2021-22 during 2nd week of November, 2021.
- The crop was harvested/threshed in March, 2022. A Total of 550 kg of yield was received.

Irrigation Water Quality

Source	EC	pH	SAR	RSC
Groundwater	6790	7.5	19.8	NIL

Soil Analysis

Depth (cm)	EC dSm-1	pH	Available phosphorus (ppm)	Available potassium (ppm)	Texture
0-15	18.9	8.1	1.4	280	Sandy loam
15-30	5.6	8.2	1.1	347	
30-60	5.5	8.3	1.0	379	Clay loam
60-90	11.9	8.3	1.2	363	

Agronomic Data

Average No. of plant/m^2	Average plant height (cm)	Average No. of branches per plant	Average No. of pods per plant	Average No. of grains per pod.
37.66	139.66	15.33	199.33	11.33

Study 2

Regular Research Study

Determination of Water Requirements of Sugarcane under Different Water Table Depths

Brief Introduction

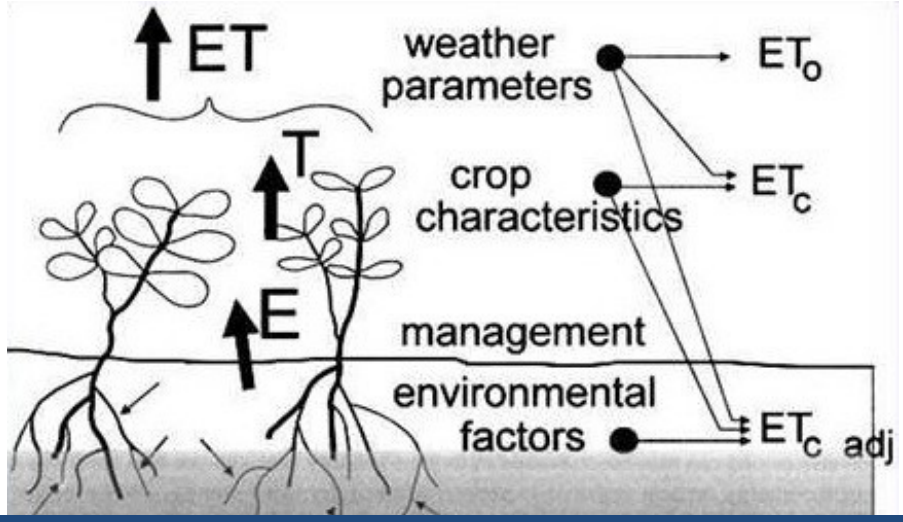
Sugarcane is a major agro-industrial crop in semiarid regions and generally has high evapotranspiration. Standardized reference evapotranspiration (ET) and location specific crop coefficients are used to estimate crop evapotranspiration. However, precise information on crop coefficient (Kc) is a major impediment in water logged areas. Field studies were conducted during the reported period at different water table depths to determine crop evapotranspiration and crop coefficients (Kc) of sugarcane for getting potential yield under water logged areas.

Objectives:

i. To determine the water requirements (WR) of sugarcane and groundwater contribution to WR under different water table depths.
ii. To determine the crop coefficient, yield and water productivity of sugarcane under different water table depths.
iii. To assess the soil salinity appraisal pre sowing and after harvesting of the sugarcane under different water table depths.

Highlights of the Year 2021-22:

The ET of Sugarcane was found as 850 mm, 832 mm and 723 mm at 1.75 m, 2.00 m WTDs and under free drainage condition (November, 2021 – April, 2022). The ground water contribution towards meeting ET was found as 68 mm and 22 mm at 1.75 m and 2.00 m WTDs.



A conceptional diagram of evapotranspiration

Commencement Date: November, 2021
Completion Date: April, 2022
Status: Continuous

Study 3

Regular Research Study

Cultivation of Various Sugarcane Varieties under Different Irrigation Methods

Commencement Date: November, 2021
Completion Date: April, 2022
Status: Continuous

Brief Introduction

Sugarcane is a row crop and can be grown under any irrigation system with the most common being surface furrow irrigation on ring-pit, raised bed and ridge irrigation. The choice of irrigation system is always site specific and should only be made after careful analysis of topography, soils, water source, water quality, power availability/cost, crop water requirement and irrigator labor availability/cost.

This analysis must also take into account both capital and operating costs and often a comparison of different systems is needed to make an optimum choice. Some larger schemes may require a combination of different irrigation systems.

This study is aimed to assess the water saving, corresponding yield and crop water productivity. After completion of study, results would be shared to end users, researchers, planners and institutes to extend the knowledge base.

Objectives:

i. To determine the yield, agronomic parameters and water productivity of sugarcane varieties grown on ring-pit, raised bed and ridge irrigation.
ii. To assess the soil salinity behavior, water saving and economic viability of sugarcane varieties grown on ring-pit, raised bed and ridge irrigation.

Highlights of the Year 2021-22:

The irrigation water depths of 417 mm, 630 mm and 771 mm was applied to sugar cane grown on ring-pit, raised-bed and ridge irrigation methods, respectively (November, 2021 – April, 2022).

Study 4

Regular Research Study

Commencement Date: May, 2021
Completion Date: April, 2022
Status: Continuous

Evaluation of Water Productivity of Wheat, Maize & Rice Crops on Bed Plantation

Brief Introduction

The outcome of the study shall provide knowledge base to develop resource conservation in rice-maize- wheat cropping system.

Objectives:

i. To ascertain resource conservation potential of raised bed planting and conventional (flood) irrigation method.
ii. To evaluate cost benefit ratio of bed plantation versus flood irrigation method.
iii. To evaluate and suggest to the farmers about efficient methods of irrigation to grow maize, wheat and rice crops which will directly contribute in the economic development of the country leading to self-reliance in food and fiber.

Highlights of the Year 2021-22:

The farmers through conventional irrigation applied 2,665 to 3,261 mm in 35 to 40 number of irrigations to the rice crop and applied 530 to 607 mm irrigation depth in 6 to 7 number of irrigation intervals. Whereas, water applied on different irrigation methods at PCRWR R&D Centre is as below;

Crop	Method	Area (acre)	No. of Irrigations	Water Applied (mm)	Yield (kg/acre)
Rice (Super Basmati)	Direct Seeded Rice (DSR) on Beds	0.94	20	1359	680
	Beds	0.87	30	1878	1320
	DSR on Flat	0.29	21	1520	1280
	Permanent Raised Beds	0.94	18	1132	1280
	Conventional	2.94	35	2780	1400
Maize (Hybrid)	Beds	1.31	7	505	1080
	Ridges	2.74	6	442	1200
Wheat (Akbar 19)	Beds	1.26	4	268	1560
	Permanent Raised Beds	0.94	4	267	1560
	Ridge	1.31	4	300	1520
	Zero Till	0.82	3	280	1600
	Pak Seeder Drill	3.80	3	215	1520
	Rabi Drill	1.01	4	308	1760
	Broadcast after Rouni	0.72	5	417	1600
	Broadcast without Rouni	0.72	4	297	1560

Study 5

Regular Research Study

Commencement Date: 2004
Status: Continuous
Progress: Quarterly basis

Quarterly Monitoring of Bottled Water Brands

Brief Introduction

PCRWR is conducting regular monitoring of mineral/bottled water samples on quarterly basis. The objective of this quarterly monitoring is to identify the sub-standard bottled/mineral water brands and to bring improvement in the quality of bottled/mineral water being provided to general public.

Objectives:

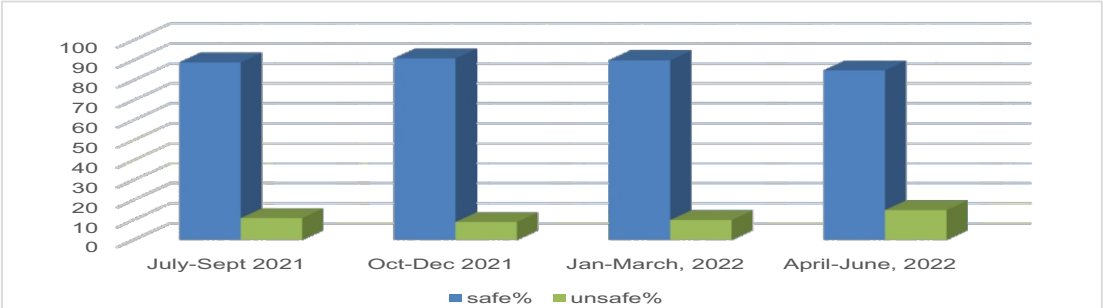
i. Monitoring of bottled water for improved supply of quality water to public.

Methodology

Seven hundred and twelve (712) bottled/mineral water samples of commercially available brands have been collected from major cities. All the samples were analyzed at ISO-17025 accredited National Water Quality Laboratory (NWQL) of PCRWR, Islamabad for physico-chemical and microbiological parameters. Laboratory findings were compared with permissible limits of Pakistan Standard Quality Control Authority (PSQCA) to evaluate the bottled water quality for the consumer's protection.

Findings

The findings of monitoring trials during July, 2021 to June, 2022 have revealed that out of 712 samples, 633 were found to be safe, whereas, 79 samples of various brands were declared to be unsafe due to chemical (Arsenic, Sodium, Potassium, TDS and Nitrate) or microbiological (Total Coliforms, Fecal Coliforms & E-coli) contamination. The findings of quarterly monitoring of bottled water were disseminated through print and electronic media and official website of PCRWR for the awareness of general public. The quarterly monitoring reports of every quarter were sent to the Chief Secretaries of all the provinces as well as to PSQCA with request to take appropriate legal action against the substandard.



Resulst of water quality monitoring of bottled water brands during 2021-22

Study 6

Research Study

Ground Water Investigations Covering the Rural Areas of Islamabad

Brief Introduction

PCRWR carried out a groundwater investigation study covering the rural areas of Islamabad. The study was aimed to assess water quality and quantity issue prevailing in the constituency.

Objectives:

i. To assess groundwater quality and quantity in Islamabad.

Methodology

- Total, 40 Electrical Resistivity Surveys were carried out at eight Unions Councils covering the rural areas of Islamabad.
- In-situ measurement of EC have been made for more than thirty water samples for quick understanding of the groundwater quality.

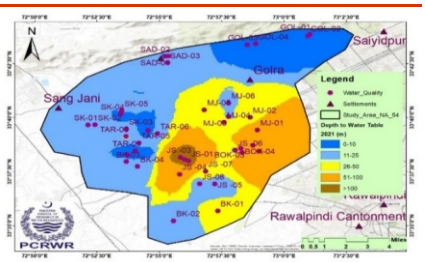
Findings

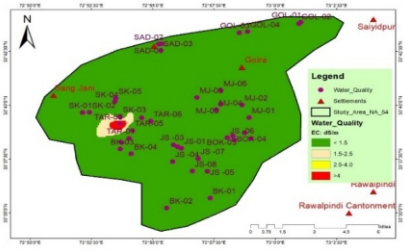
There was a huge variation in depth to water table.

DWT (mtr)	Area	EC (dS/m)
10-50	UC-39 (Mera Jaffar), UC-48 (Badhana Kalaan), UC-47 (Tarnol), UC-48 (Saraye Kharboza), UC-49 (Shah Allah Ditta), UC-50 (Golra). UC-45(Jhangi Syedan) (Dhoke Boota Khan) (Sadiq Town)	0.50 to 1.5
51-100	UC-44 (Bokra), UC-45 (Jhangi Syedan)	
	UC- 47 (Tarnol) (Ratti Kassi)	3.5

Conclusion & Recommendations

- Quantity of groundwater was major issue found whereas groundwater quality was found good.
- The transmission of groundwater within the aquifer was very slow.
- At least two water supply schemes in each village should operate at alternate timings to avoid the cone of depression.
- Rainwater harvesting techniques and artificial recharge well should be prioritized in these areas. Small Dams on local level should be constructed.





Commencement Date: 2021
Completion Date: 2021
Status: Completed

Study 7

Research Study

Assessment of Surface and Groundwater Resources of Gwadar

Brief Introduction

PCRWR on the directions of the Ministry of Planning Development and Special Initiatives has recently conducted a comprehensive study to conduct a wholesome analysis of water supply, distribution and management in Gwadar city.

Objectives:

i. To evaluate the current and future gaps in water supply of Gwadar city and
ii. To assist the local stakeholders in bridging these gaps.

Highlights of the Year 2021-22:

- Review of existing statistical data.
- Data collected by field teams.
- Carried out assessment of groundwater potential.
- Carried out assessment of water quality.
- Analysis and reporting of all the data collected.
- Final Report comprising current situation of water supply, demand, gaps, water quality and way forward has been shared with the Ministry of Planning Development and Special Initiatives, Gwadar Development Authority and all stakeholders for further actions.

Commencement Date: June, 2021
Completion Date: June, 2022
Status: Completed

Study 8

Research Study

Scenario Study of Existing Water Facilities for Sustainable Ground Water Resources Management at Fauji Fertilizer Company Limited (FFC) Goth Machhi

Brief Introduction

Water is an essential component for operation of any fertilizer plant without which the concept of fertilizer production ceases to exist. FFC like other reputable business conglomerates is also revamping its business philosophy by implementing various strategies to sustain its core business. One of the organizational review of risks to the existing business is identified as water scarcity which is to be addressed on war footings.

Objectives:

i. Evaluation of current water quality and water table depth status in the Ahmad Pur Lama (APL) water facilities.
ii. Assessment of the groundwater profile in the area and proposal for best fit depth and spacing of the tube wells.

Highlights of the Year 2021-22:

- The ground water abstracted from Ahmed Pur Lamma (APL) a small town of Sadiqabad, situated ~8.5 km away from the city.
- Canal water has only been available average ≈ 41% over the last 10 years against the designed supply of 80%, Thus scenario compelling FFC to shift dependency on groundwater.
- There is a small pocket of fresh water in this area and major industries like Fauji Fertilizer, Fatima Fertilizer and drinking water supply for Sadiqabad city rely heavily on this source.
- FFC has installed 68 tube well in the area of about 305 acres.
- PCRWR Regional Office Lahore conducted electrical resistivity and tubewells surveys in the study area. the data collected will be used to develop assessment reports for FFC.

Commencement Date: April, 2022
Completion Date: December, 2022
Status: On-going

Smart Water Quality Monitoring (SWQM) of Water Filtration Plant

National Water Quality Laboratory has managed to install online sensors for Total Dissolved Solids, pH and flow of treated water being provided free of cost to the general public. Though water quality of the plant is monitored on weekly basis in the laboratory, however real time monitoring using Internet of Things (IoT) is a continuous system designed to monitor drinking water quality in the best interest of public health.

Picture of SWQM monitoring display screen

Cholera Response Activities in Sindh, Balochistan and Khyber Pakhunkhwa

PCRWR in collaboration with UNICEF, Pakistan is conducting water quality monitoring and treatment in cholera affected areas of Sindh, Balochistan and Khyber Pakhtunkhwa provinces in response to cholera outbreak. PCRWR teams are undertaking testing for cholera agent Vibrio cholera for water sources mapping followed by the disinfection of water supply and storage and community awareness in Karachi Central, Karachi East and Karachi South districts of Sindh, Dera Bugti, Harnai and Chaman districts of Balochistan province, Swat and Kohat districts of KP. PCRWR teams are working day and night in close coordination with provincial stakeholder organizations to help them and local communities to reduce mortality and morbidity rates especially of children under five.

Glipmse of onsite water quality sampling

Improving Access to Clean Drinking Water for the Urban Poor in Karachi, Pakistan

PCRWR in collaboration with WaterAid Pakistan through a project envisioned for provision of improved access to sustainable clean drinking water to the communities in urban poor areas of Karachi, established solarized water filtration plant. Solar powered Ultra Filtration (UF) plant having capacity of 70,000 GPD have been installed in Gadap Town, district Malir, Karachi. The filtration plant will be operated by the local community through water user committee. Approximately 15,000-20,000 people are benefiting on daily basis.

Solar powered UF plant installed in Karachi

Installation and upgradation of safe water facilities in 20 schools of Punjab

PCRWR and Aab-e-Pak Authority, upgraded /installed safe water system and carried out WASH activities in 20 adopted schools under “Adopt a school” program. PCRWR teams installed/upgraded filtration plants, constituted WASH committees in consultation with the principal to assign the responsibilities among members. District water quality laboratories of PCRWR are monitoring the water quality of adopted schools on regular basis.

Drinking water filtration plant installed in schools

Meetings and Visits

Korean Experts Visited PCRWR

Islamabad

A delegation of Korean experts from Korean International Cooperation Agency (KOICA), K-Water and Urban Ministry of Trade, Industry and Energy visited PCRWR on 4th August, 2021. The meeting was held to discuss the implementation of the newly approved Project "Capacity Building on Water Quality Monitoring and SDG 6 (6.1) Reporting".

Chairman PCRWR, Dr. Muhammad Ashraf briefed the Korean Experts on the research, development and capacity building initiatives of PCRWR specifically on Water Management and Water Quality.

The Deputy Director, KOICA, Mr. Junho Choi appreciated the contribution of PCRWR in addressing the water challenges of Pakistan. It is worth mentioning here that PCRWR has contributed in conceptualization and development of this Pak-KOICA joint project and will be the main partner in the project implementation.

Glimpse of the Meeting

KOICA Expert Team Visited PCRWR

Islamabad

KOICA Expert members from Project Management Company of the project Capacity Building on Water Quality Monitoring and SDG 6 (6.1) Reporting visited PCRWR Islamabad. The Team of experts included Mr. Sunbaek Bang, Team Leader/ Cooperation Business Team, Ms. Jin Yu, Deputy Director/ Cooperation Business Team and Mr. Abdul Rehman, Program Officer, KOICA.

Project components such as training, basic plan for developing an MIS in KP, administrative statistics report regarding water in Islamabad and standard operating procedure for PHED laboratories in KP and Punjab were discussed. At the end the Secretary PCRWR demonstrated the groundwater recharge and rainwater harvesting system installed at PCRWR premises.

Glimpse of the meeting

Hungarian Water Experts Visited PCRWR

Islamabad

The Hungarian water expert team visited PCRWR headquarters, Islamabad on 17th May, 2022. The delegation comprised of Mr. Peter Kovacs, Water Director, Head of River Basin Management and Water Protection Department, Ministry of Interior, Mr. Jeno Labdy, General Director, General Directorate of Water Management, Mr. Attila Lovas, Director, Middle Tisza Region Water Management Directorate and Mr. Zoltan Bencs, Director, South Transdanubian Water Management Directorate, Hungary. The officers from Federal Flood commission (FFC), Ministry of Water Resources, Islamabad also accompanied the delegation. Dr. Muhammad Ashraf, Chairman, PCRWR presented a detailed overview of R&D activities and initiatives taken up by the council to combat the water issues of Pakistan. The Chairman briefly discussed about the possible areas of collaboration.

Mr. Peter Kovacs appreciated the work of PCRWR and emphasized the need of collaboration and capacity building of the professionals of the both countries in future. The delegation also visited different facilities of PCRWR and National Water Quality laboratory of PCRWR, Islamabad.

Group photo of meeting participants

Meeting with World Bank Delegates

Islamabad

Ms. Lucy Lytton, Senior Water Resources Management Specialist, and Mr. Francois Onimus, Senior Water Resources Specialist visited PCRWR, Islamabad on 16th December, 2021. Dr. Muhammad Ashraf, Chairman, PCRWR, briefly presented the different activities which were being carried out by the PCRWR. The World Bank representatives appreciated efforts of PCRWR and emphasized the need for future collaborations in the water sector.

Glimpse of the meeting

Meeting With FAO Representatives

Islamabad

A meeting with FAO representatives Ms. Emelda Berejena (GCF project Manager), Mr. Jiro Ariyama (International Water Resource Expert) and Ms. Rubina FAO Pakistan was held at PCRWR Headquarters, Islamabad on 29th November, 2021. The meeting was intended to discuss the project entitled "Transforming the Indus Basin with Climate Resilient Agriculture and Water Management". Dr. Muhammad Ashraf, Chairman PCRWR briefly described PCRWR work on water management and ongoing projects. FAO representatives appreciated PCRWR initiatives and efforts to address water challenges and their solutions for the sustainability of the water. The FAO team offered to work together in the future to combat the impacts of climate change in the water Sector.

Photo of meeting participants

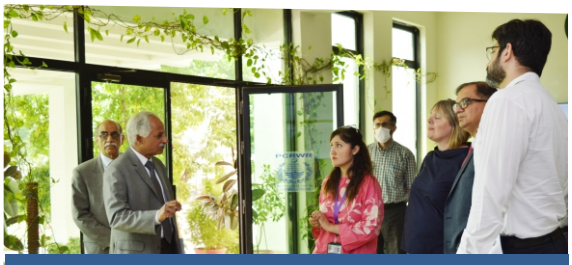
Delegation from FCDO and IWMI Visited PCRWR

Islamabad

A delegation comprising of officials from the UK's Foreign Commonwealth and Development Office (FCDO) and International Water Management Institute (IWMI) visited PCRWR on 19th April 2022.

Dr. Muhammad Ashraf, Chairman, PCRWR gave a brief on the collaborative activities of PCRWR and IWMI. He also described the ongoing project of PCRWR with CDA in which PCRWR is accounting for surface and groundwater balance in the ICT area.

Ms. Pauline Seenan, Head Climate and Resilience Group, British High Commission, Islamabad, briefed the participants about the Water Governance Project objectives. Ms. Sana Zia, UK Development Adviser Punjab, gave a brief about the pilot area of the Worldwide Responsible Accredited Production (WRAP) and the project would be implemented in Punjab.



Glimpse of the meeting

Meeting with ADPC Expert Team

Islamabad

Asian Disaster Preparedness Center (ADPC), Pakistan expert team visited PCRWR, headquarters, Islamabad on 26th April 2022. The agenda of the meeting was to brief the ADPC team on PCRWR research activities. Dr. Muhammad Ashraf, Chairman, PCRWR gave a brief on technologies introduced by PCRWR to combat water scarcity in the country.

Lt. Gen (R) Nadeem Ahmed, National advisor, APDC, applauded different initiatives of PCRWR to address the issues related to water sector and showed his great interest to work in the collaboration in the light of PoC signed between the two organizations. Mr. Irfan Maqbool, Director, Risk Management, ADPC highly appreciated the work of PCRWR in the country to raise awareness by doing action research in water sector. He also showed his keen interest to work in collaborations with PCRWR.

Group photo of ADPC team with Chairman PCRWR

Meeting With WaterAid & Musawi

Islamabad

A meeting was held with WaterAid and Musawi on 20th October, 2021 at PCRWR Headquarters Islamabad. The agenda of the meeting was to review the already enacted provincial water acts and identify gaps which hinder their practical implementation on ground. WaterAid in collaboration with Musawi shared findings of their synthesis of existing federal and provincial laws related to groundwater resource management. Dr. Muhammad Ashraf, Chairman PCRWR appreciated the work of WaterAid and Musawi and ensured continued technical support of PCRWR for a productive outcome.

Dr. Niaz Ahmed, Head Policy Section, WaterAid, Islamabad and the representative of Musawi-Pakistan admired the excellent work of PCRWR towards sensitization of water conservation, rainwater harvesting and on top of that transforming technical information into right action by providing necessary legal framework for better groundwater resources management in ICT as well as in the Country.

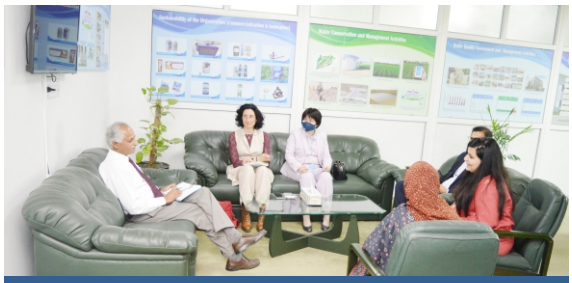
Glimpse of the meeting

UNOPS Delegation Visited PCRWR

Islamabad

A delegation of United Nations Office for Project Services (UNOPS) Pakistan visited PCRWR on 6th April, 2022 to explore the possibilities of future collaboration and to see the PCRWR facilities. Delegation comprised of Ms. Alice Qin Zhongguang, Head of Programme, UNOPS Asia Region, Susana Lardies Zabala, UNOPS Pakistan, Shiraz Shahid, WASH Specialist, UNOPS Pakistan and Humairah Jabeen, Project Manager, UNOPS Pakistan.

Chairman, PCRWR Dr. Muhammad Ashraf provided an overview of PCRWR research activities. Dr . Hifza Rasheed D.G. (WQ) showed the facilities of National Water Quality Laboratory and NCBI. Engr. Muhammad Dilshad demonstrated the Recharge well to the delegation. The UNOPS delegation showed keen interest to work jointly on issues related to WASH.



Glimpse of the meeting

Delegate from IWMI Visited PCRWR

Islamabad

Dr. Racheal McDonnel, Deputy Director General, IWMI visited PCRWR headquarters, Islamabad on 19th May, 2022. Dr. Mohsin Hafeez, Country Director, IWMI, Pakistan also accompanied the guest. Dr. Muhammad Ashraf, Chairman, PCRWR welcomed the guests and presented a detailed overview of R&D activities and initiatives taken up by the Council to combat the water issues of Pakistan. The Chairman briefly discussed about the ongoing collaborating projects of PCRWR with IWMI, Pakistan.

Dr. Racheal McDonnel appreciated the work of PCRWR and took keen interest in the different initiatives of PCRWR in water sector. She also visited different facilities of PCRWR like Indus Telemetry, Rooftop rainwater harvesting model, groundwater recharge and hydraulic Ram Pump at the PCRWR, headquarters, Islamabad. After that the guests visited the rainwater harvesting site at Kachnar Park, I-8, Islamabad along with Chairman, PCRWR and team.

Group photo of IWMI delegation with PCRWR officials

Delegation from Secours Islamic, France Visited PCRWR

Tandojam

Dr. Altaf Ali Abro, Head of Mission and Country Manager, Secours Islamic, France (SIF), Islamabad, Pakistan along with Mr. Neel Amber, Managing Officer, Secours Islamic, France, visited DRIP-PCRWR, Tandojam on 16th May, 2022. Engr. Nazar Gul, Deputy Director, DRIP-PCRWR, Tandojam briefed the delegation about the contribution of PCRWR to drought mitigation activities being carried out at Mithi.

ICIMOD Officials Visited PCRWR

Islamabad

ICIMOD officials visited the Pakistan Council of Research in Water Resources (PCRWR) headquarters, Islamabad on 28th December, 2021. Mr. Farid Ahmad, Head Strategic Planning, Monitoring and Evaluation, ICIMOD Headquarters, Nepal and Mr. Muhammad Ismail, Country Representative, ICIMOD Country Office, Pakistan visited PCRWR on 28th December, 2021. Purpose of the meeting was to explore opportunities to build on previous joint work at Gilgit-Baltistan, holding a dialogue in Gilgit-Baltistan for formulation of Water Policy and strengthen Upper Indus Basin Network (UIBN), Pakistan Chapter. The Chairman, PCRWR expressed full support of PCRWR.

Glimpse of the meeting

UNESCO's Delegation Visit to PCRWR's Karez Site

Islamabad

Ms. Patricia Mcphilips, UNESCO's Director, Pakistan, paid a visit to the demonstration site of a Karez located near Quetta and interacted with local community regarding the functions and social uses of Karez. The Karez stakeholder community informed the delegation how Karez rehabilitation work initiated by PCRWR has benefited the communities in management of their cultivated land and orchards, thus improving their livelihood.

Country Director UNESCO visiting karez site, Quetta

Meeting on Water Issues of Islamabad

Islamabad

The honorable Federal Minister for planning, Development & Special Initiatives, Mr. Asad Umar, chaired a meeting on water issues of Islamabad. Dr. Muhammad Ashraf, Chairman, PCRWR and Member, CDA briefed the chair that the groundwater recharge through rainwater harvesting on 25 sites has been started whereas, 50 site would be developed by December, 2021. Mr. Asad Umar appreciated the technical expertise of PCRWR and directed CDA to speed up the work as well as ensure completion of 120 sites by June, 2022.

Glimpse of the meeting

Meeting with PINSTECH Team

Islamabad

PINSTECH team lead by Dr. Samina Roohi, Director-PINSTECH visited PCRWR Headquarters, Islamabad on 7th October, 2021. The PINSTECH team briefed PCRWR experts about their on-going studies related to effect of climate change on water resources and soil erosion especially in coastal landscape with respect to sea level rise. Dr. Muhammad Ashraf, Chairman, PCRWR appreciated the good work conducted by the scientists at PINSTECH and briefly introduced the recent initiatives of the Council regarding water resource management, rainwater harvesting, soil salinity and seawater intrusion in the Indus Delta. Moreover, Chairman, PCRWR emphasized the need for further strengthening the collaborative research in a way to achieve a productive partnership.

Glimpse of the meeting

NIH Team Visited PCRWR

Lahore

PCRWR is collaborating with the National Institute of Health, Islamabad for One Health Surveillance TRIUMPH project (Improving the TRIcycle protocol: upscaling to national Monitoring, detection of CPE and WGS pipelines). A team comprising of professionals of National Institute of Health (NIH), Islamabad visited PCRWR office, Islamabad and Lahore to discuss the role of PCRWR in R&D activities of One Health Project. Following this PCRWR will join this project as workshop partner.

Meeting with WASA, Rawalpindi

Islamabad

Mr. Haroon Kamal Hashmi, Vice Chairman, WASA, Rawalpindi visited PCRWR Headquarters, Islamabad on 8th October, 2021. The WASA, Rawalpindi team highlighted various drinking water supply challenges being faced in Rawalpindi. Dr. Muhammad Ashraf, Chairman, PCRWR briefly introduced the recent initiatives of the council regarding water resource management and rainwater harvesting in Islamabad Capital Territory. The experts of PCRWR introduced WASA team to various solutions towards achieving sustainable groundwater management. The WASA team were also demonstrated the practical models of rainwater harvesting systems for multiple uses piloted by PCRWR at its premises.

Glimpse of the meeting

Visits of Federal Secretary MoST

Islamabad

Dr. Akhtar Nazir, Federal Secretary S&T, Visited PCRWR on Thursday 23rd September, 2021. Dr. Muhammad Ashraf, briefed about the on-going research activities, accomplishments and various water quality monitoring techniques. He later visited PCRWR Research & Demonstration Centre, Sialmore-Sargodha on 10th October, 2021. The Chairman, PCRWR Dr. Muhammad Ashraf briefed about the research studies being carried out mainly focused on water management & conservation through effective management practices/techniques to the Secretary MoST.

Chairman PCRWR briefing Federal Secretary on groundwater recharge well at PCRWR

Dr. Kazim Niaz Fedreal Secretary MoWR Visited PCRWR

Islamabad

Dr Kazim Niaz, Federal Secretary Ministry of Water Resources, visited PCRWR on 7th May, 2022 along with Joint Secretary (Water) and Joint Secretary (Admin). The Chairman, PCRWR welcomed the guests and gave a detailed briefing on PCRWR's activities and functions.

The Secretary, MoWR also visited different facilities of PCRWR like Indus Telemetry, Rooftop Rainwater Harvesting model, Groundwater Recharge and Hydraulic Ram Pump. He showed keen interest in the initiatives taken up by the council and appreciated the activities of PCRWR in line with National Water policy 2018.

Chairman PCRWR presenting souvenir to Secretary, MoWR

Human Resource Development

Training on Groundwater Modeling and Big Data

Islamabad

PCRWR organized a training on Groundwater Modeling and Big Data from 14th – 18th March, 2022 in its Headquarter at Islamabad. The training was organized to build capacity of Sindh Irrigation Department (SID), Sindh Irrigation and Drainage Authority (SIDA) and PCRWR professionals under the project Groundwater Investigation and mapping in Sindh. The training consisted of three days lectures and two day practical demonstration on software. Fifteen participants attended the training.

Glimpse of the training session

Training Workshop on Groundwater and Watershed Modelling

Lahore

A training workshop on "Groundwater and Watershed Modelling" was organized under Graduate Information Management System (GIMS) Project from 16th to 20th May, 2022 at PCRWR Regional Office, Lahore. The objective of the training was to build the capacity in groundwater and surface water modeling, in which 11 participants from Sindh Irrigation and Drainage Authority (SIDA) and PCRWR and resource persons participated.

Glimpse of the training session

Two-days Training Workshop for Water Operators

Lahore

PCRWR Regional Office, Karachi organized a two-day training workshop from 24th -25th November, 2021 for water operators and care takers for operation and maintenance required for clean drinking water facilities and follow ups related to water quality. Trainees were from District Municipal Committee, Local Government, and Community water user committees at Pak colony DMC Site, Keamari Karachi. Training was arranged under Water Aid project.

Training of Citizen Scientists

Bahawalpur-Multan-Tando Allah Yar

As a part of Climate Innovation Challenge project, PCRWR has implemented the component of "Citizen Science" at three project areas; Bahawalpur, Multan and Tando Allah Yar. In each project district, 10-15 farmers are selected through a pre-defined site selection criterion. Farmers are provided with 5 weather measurement gadgets; Thermometer, hygrometer, rain gauge, barometer and anemometer. Farmers are trained to send data through a mobile phone app.

Group photo of Citizen Scientists

Training of Master Trainers with FAO Collaboration

DRIP, Tandojam

DRIP-PCRWR in collaboration with FAO organized ten (10) days training program for master trainers from 21st to 31st March, 2022 at DRIP-PCRWR, Tandojam. Engr. Hafiz Abdul Salam, Director Incharge and Engr. Nazar Gul, Deputy Director, DRIP, Tandojam briefed the trainers regarding the R&D activities being carried out at DRIP, PCRWR, Tandojam.

Briefing of Trainers at DRIP, Tandojam

Capacity Building Training of Professionals on ADCP Data Acquisition

Tandojam

PCRWR, DRIP, Tandojam organized a three days training program under the Graduate Information Management System (GIMS) project for capacity building of professionals on Acoustic Doppler Current Profiler (ADCP) data acquisition, practical demonstration, data processing and analysis at DRIP, Tandojam office from 7th June 2022 to 9th June, 2022. Ten (10) professionals from SIDA, Hyderabad, and PCRWR attended the training program.

A glimpse of the field training day

Training on Water Quality Monitoring

Bahawalpur

PCRWR Regional Office, Bahawalpur arranged one day training at NRSP office, included demonstration on water sampling from various sources; field testing, presentation, storage, transportation and field documentations for water quality monitoring of public sources. A training session was arranged for sampling methods (especially for microbiological analysis) to train the staff of "HELP IN NEED". The staff of this NGO will be able to collect water sample after the installation of hand pumps.

Two Weeks Training Workshop for Students of University of AJ&K

Muzaffarabad

A two week training workshop was organized by the PCRWR Regional Office Muzaffarabad for the Geology Students of the University of AJK from 10th-25th November, 2021. The training was intended to impart the knowledge to students and enhance their skills on Water Quality Monitoring, Regional Water Management Practices and Clean Green Environment Program.

Group photo of the students

NAVTTC Training Course Under “Prime Minister's Skills for All"

Islamabad

After successful completion of 2 batches of 6 Months Diploma Course “Water Quality testing and Treatment Technician”, PCRWR in collaboration with NAVTTC under “Prime Minister's Skills for All Hunarmand Pakistan (Kamyab Jawan Initiative)” has launched Batch-III of the same course in 07 cities of Pakistan including Islamabad, Lahore, Bahawalpur, Multan, Sargodha, Sahiwal and Gilgit. In this course, 200 unskilled youth will get skills for employability and to meet the requirements of water sector and industry.

WASH Awareness Sessions Conducted in Government Schools and Universities

Muzaffarabad-Gilgit- Karachi

PCRWR Regional Offices conducted various awareness sessions on WASH in different parts of the country. Under these activities, WASH Committees were constituted at each school to maintain WASH and its related activities in their respective institutes. Total 25 such sessions were conducted during the quarter in which one session was conducted in Muzaffarabad, one in Gilgit and 23 sessions were conducted in different Union Councils of Karachi.

Group photo of students of KIU, Gilgit participated in WASH Awareness Session

Photo of the students and participant marching an awareness walk on WASH in Karachi

PCRWR Regional Office Karachi Organized Global Hand Washing Day

Karachi

PCRWR Regional Office Karachi organized Global Hand Washing Day at Pak Colony, district Kaimari, under WaterAid project on 21st October, 2021. The Global Hand Washing Day 2021 was celebrated with the theme “Our Future is at Hand- Let's Move Forward”. Mr. Asif Khan, Special Assistant to Chief Minister Sindh graced the occasion to mark the Global Handwashing Day 2021 as chief guest. More than 110 participants including children attended the event.

Mr. Asif Khan, Special Assistant to Chief Minister Sindh speaking on the occasion

Participation in KOICA-ICEC Global Online Fellowship Program

Tandojam

The International Climate and Environment Center (ICEC) and KOICA conducted online fellowship program on "Sustainable Water Resource Management for Climate Change Response for Pakistani officials from 3rd to 10th August, 2021. In total 16 participants attended the course from PCRWR. The ten days intensive training course was designed to strengthen the international cooperation network by revitalizing participation of local Government, and thus aid in preparing the next generation of water managers. PCRWR's officials prepared and presented action plans specifically applicable to Pakistan. Through these action plans, ICEC and University of East Anglia (UEA) will look for collaborative opportunities for regional projects.

Screenshot of training participants in opening session

Participation in UEA Yeosu Summit, 2021

PCRWR professionals participated in an online opening session of 2021 UEA (Urban Environmental Accords) Yeosu Summit held from 29th September to 1st October, 2021 in Korea. This Summit was organized into 7 thematic sessions encompassing different aspects of urban sustainability and net-zero waste. Various stakeholders illustrated their regional perspectives along with the common challenges and goals.

Participation in Workshop Organized by Asian Disaster Preparedness Center

Engr. Faizan-ul-Hasan, Secretary, PCRWR and Hafiz Abdul Salam, Regional Director, DRIP attended a workshop organized by Asian Disaster Preparedness Center (ADPC) on 16th May 2022, at Jamshoro. This workshop was intended to identify opportunities for collaboration in Pakistan as part of its Climate Adaptation and Resilience (CARE) for South Asia project.

Glimpses of the meeting

Services

Water Quality Testing and Analysis

National Water Quality Laboratory of PCRWR is one of the state of the art Laboratories of Pakistan with high tech water testing equipment and well trained professionals. It is ISO- 17025:2017 accredited Laboratory. The provision of water and wastewater testing and advisory services to the general public and public and private organizations is a continue activity. NWQL is also executing the ground water, surface water as well as wastewater assessment and monitoring projects of government and or with collaboration of national and international organizations.

Water Quality Analysis

Groundwater Investigations

PCRWR has a fully trained team equipped with latest tools and equipment for groundwater investigations. Usually, Electrical resistivity surveying methods have been widely used to determine the thickness and resistivity of layered media for the purpose of assessing groundwater potential and drilling boreholes in fractured unconfined aquifers.

Groundwater Investigation

Laser Land Leveling

Laser Land Leveling is a process of smoothening the land surface from its average elevation with a certain degree of desired slope using a guided laser beam through-out the field. Laser leveling of agricultural land is a recent resource-conservation technology. The Research and Demonstration Farms of PCRWR are equipped with the latest Laser Land Levelers and the services are provided to the farmers on their request.

Laser Land Levelling

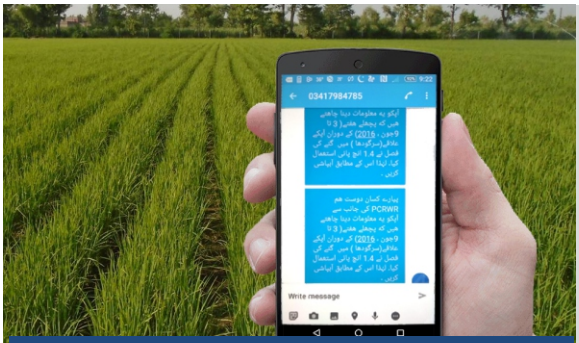
Soil Testing Service

PCRWR has maintained a state of the art soil physics laboratory at its headquarters. Soil testing is an important diagnostic tool for determining the nutrient needs of plants and for environmental assessments. The major laboratory testing includes soil moisture percentage, organic matters in soil, soil moisture retention curves, soil moisture extraction for chemical analysis. PCRWR soil physics laboratory is unique in Pakistan providing all above mentioned tests under one roof.

Pressure plate appratus

Irrigation Advisory Services

PCRWR launched the service on April, 2016, which is an outcome of international collaboration extended by the University of Washington (UW) and NASA. The SMS based Irrigation Advisory Services of PCRWR are being provided free of cost to about 20,000 farmers on weekly basis in 41 districts of Pakistan. However, PCRWR envisions extending the service to all farmers of irrigated areas, through international and national coordination.



Irrigation Advisory Text Message

Publications

Research Report

Hydro-Morphology of the Tributaries and Active Flood Plains of the River Indus

Authors:

Manzoor Ahmad Malik
Muhammad Ashraf

Citation:

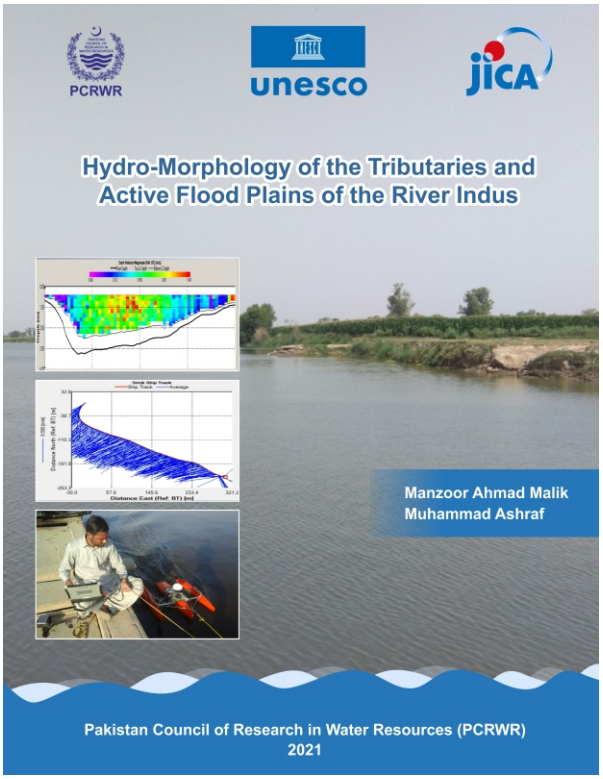
Malik, M.A., M. Ashraf (2021). Hydro-Morphology of the Tributaries and Active Flood Plains of the River Indus. Pakistan Council of Research in Water Resources (PCRWR). pp 80.

Online available:

https://pcrwr.gov.pk/wp-content/uploads/2020/Water-Management-Reports/Hydro-Morphology%20(21%20September-2021).pdf

Executive Summary

The River Indus Basin is amongst the regions most vulnerable to climate change, its eastern tributaries are frequently inundated during monsoon. Past few decades have seen increased frequency and intensity of floods which are anticipated to exacerbate. The region is thickly populated and intensely cultivated. Recent floods played havoc with life and property. Disaster risk reduction demands improved flood forecasting, that requires updated primary data for modeling tools. River flow regimes, river morphology and soil physico-hydraulic features are key inputs for such models.



In this study, PCRWR carried out measurements of river flow regimes, cross-sectional profiles, bed material, seepage rates, and soil physico-hydraulic properties of the active flood plains on both sides of the tributaries. For river flow regimes and morphological features, Acoustic Doppler Current Profiler (ADCP) was used. Bed material was collected and analyzed for mean particle size and uniformity coefficient. Locally developed seepage meter was used for seepage rate measurements. Improved double ring infiltrometer for infiltration rate, hydrometer method for soil texture, and pressure plate and hanging table extractors were used for soil-moisture retention characteristics.

The ADCP can generate reliable data of river flow regime and morphology if usage guidelines are followed properly. Bed material mean particle size decreases towards downstream reaches of the rivers Jhelum, Chenab and Ravi in conformity with Sternberg's law, but is vice versa in case of river Sutlej. Uniformity coefficient of bed material shows no systematic trends. Seepage rates also have mixed trends, but are generally more in upper reaches in line with bed material mean particle sizes.

Silt loam, loam and sandy loam are dominant soils in three horizons up to 1.0 m depth in the active flood plains, but coverage of sand dominant classes increase with depth. Infiltration data fitted better on Horton's model than Philip's. Dominant range of steady- state infiltration rate is 15-30 mm/hr that increases towards 60-90 mm/hr at the deeper layer. Average bulk density up to 1 m depth profile is 1.44 - 1.45 mg/cm^3 with coefficient of variability (CV) in low range of 8.68 - 9.31%. Average Horton's steady-state infiltration varied from 0.45-76.75 mm/hr with high CV in the range of 135 - 158%; van Genuchten Θs average values are 0.45 - 0.46 cm^3/cm^3 with CV in the low range; Θr is 0.05 - 0.06 cm^3/cm^3 with CV in the medium range; α ranges 0.01 - 0.02 cm-1 with medium CV; and n have average values of 1.06 -1.90 with CV in the medium range. Average organic matter is 0.68 -1.27% with medium variability in the three horizons up to 1.0 m depth.

Integrated Water Resources Management Implementation Guidelines for Pakistan

Authors:

Bareerah Fatima
Faizan ul Hasan
Muhammad Ashraf
Anwaar Ahmad

Citation:

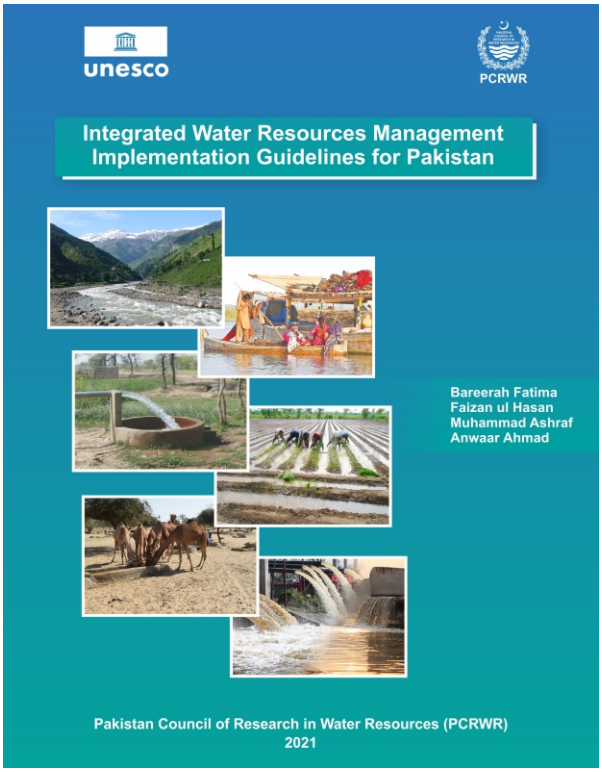
B. Fatima, F.U. Hasan, M. Ashraf, and A. Ahmad. (2021). Integrated Water Resources Management, Implementation Guidelines for Pakistan. Pakistan Council of Research in Water Resources (PCRWR), Islamabad, pp 84.

Online available:

https://pcrwr.gov.pk/wp-content/uploads/2020/Water-Management-Reports/IWRM%20Report%20(1-9-2021).pdf

Executive Summary

Integrated Water Resources Management (IWRM) is a process which revolves around an evolutionary concept of water resources management. It does not claim that implementing IWRM will resolve all challenges faced at once as soon as it is implemented. It is a continuous process which allows for consistent planning, re-assessment of plans, implementation and plan the information management system. It does not offer a solution that fits all, rather it is a process



that allows user and managers to interact and develop their own unique experiences around it. Understanding the IWRM process in its true sense is a first challenge and step in the process. The second major challenge is "who will decide" how to kick start IWRM implementation process. The answer exists in the principle of IWRM that means coordinated management and development of land and water resources. The success stories of IWRM implementation around the globe reveal that independent, well informed and politically strong institutions are required to steer the IWRM process. These institutions are known as "River Basin Organizations" or "River Basin Committees". In Australian experience, the governance structure for the implementation of IWRM may be of top-down setting in a way that it performed in bottom-up manner. In Pakistan's context, the purpose of IWRM implementation guidelines is to get it right at first and then plan/act for coordination at the next step. IWRM has been embedded and highlighted in federal and provincial polices, regulations and strategies. The attempts are also being made to develop such set of institutions that may help in the implementation of IWRM process. It is essential to understand the limitation of scale in Pakistan. The whole country is benefited by a single Indus River Basin, but water resources management has become a provincial subject after 18th Amendment in the constitution. This arrangement has the potential to make River Basin Management easier, if sub-divided into provincial administrative boundaries. Geographically, Indus River Basin in Pakistan has Gilgit Baltistan region as the upper most riparian but it uses very less of its share. Punjab province is upper riparian of Sindh province whereas Sindh is upper riparian of Balochistan province. Water interests are mostly conflicting when it comes to water use in agriculture. Whereas, other uses and issues related to water are often ignored or less discussed. The recent development in provinces regarding policies has embraced IWRM concept principally. Thinking process of senior managers regarding IWRM implementation is a major break through. This situation makes these guidelines even more purposeful. The IWRM approach offers a middle ground to work out water utilization across all sectors while keeping in view disaster management. This document offers an opportunity to the users for implementing IWRM process even at district scale. It helps to understand the needs of water across the users and how to prioritize water resources management practices for sustainable management of land and water resources.

Sustainable Development Goal 6 Policy Support System (PSS)

Authors:

Bareerah Fatima
Faizan ul Hasan
Muhammad Ashraf

Citation:

Fatima B., Hasan F.ul, and M. Ashraf, (2022). Sustainable Development Goal 6.0 Policy Support System (PSS). Pakistan Council of Research in Water Resources (PCRWR), Islamabad, pp 27.

Online available:

https://pcrwr.gov.pk/wp-content/uploads/2022/06/Sustainable-Development-Goal-6-Policy-Supprot-System-PSS-2022.pdf

Executive Summary

Sustainable Development Goals of United Nations also famously known as Agenda 2030, were launched in 2015 at the conclusion of Millennium Development Goals (MDG's). SDG 6 is exclusively related to water with its cross-cutting relationship with other 16 SDGs. UN efforts to resolve global water issues dates back to 1977, the first international convention on water. Since then, some agendas and programs were agreed. However, these efforts could not bring desired results because there was no comprehensive mechanism for reporting the progress except household and other

administrative surveys. Moreover, these reporting methods were not able to establish a link to the reported progress with overall development framework of the nations.

A unique characteristic of SDGs is that these are country-led rather UN-led compared to MDGs. In this regard, the nations will have to set their own targets and set-out an enabling environment to achieve them. This is a challenging task and countries alone are not able to meet it without knowledge support from UN and its related organizations. United Nations University-Institute of Water, Environment and Health (UNU-INWEH) developed a tool “Policy Support Systems (PSS)” for SDG 6 under a project “Water in the World we want: SDG 6-PSS”. This tool has been introduced and tested in five countries; South Korea, Pakistan, Ghana, Costa Rica and Tunisia.

Under this project, national workshops were held introducing PSS to the stakeholders in partner countries for the purpose of capacity building regarding SDG 6 and PSS tool. In Pakistan, a national workshop and 5 provincial workshops were organized involving more than 70 professionals from various stakeholder organizations. On the basis of lessons learnt from these workshops, this handbook is developed. It provides a step-by-step methodology to the users for operating SDG 6 PSS. This tool would transform data into useful information for better policy decision for the implementation of SDG 6.

Adapting to Salinity in the Southern Indus Basin Project: Policy Review

Authors:

Muhammad Ashraf
Bareerah Fatima
Faizan ul Hasan
Hafiz Abdul Salam

Citation:

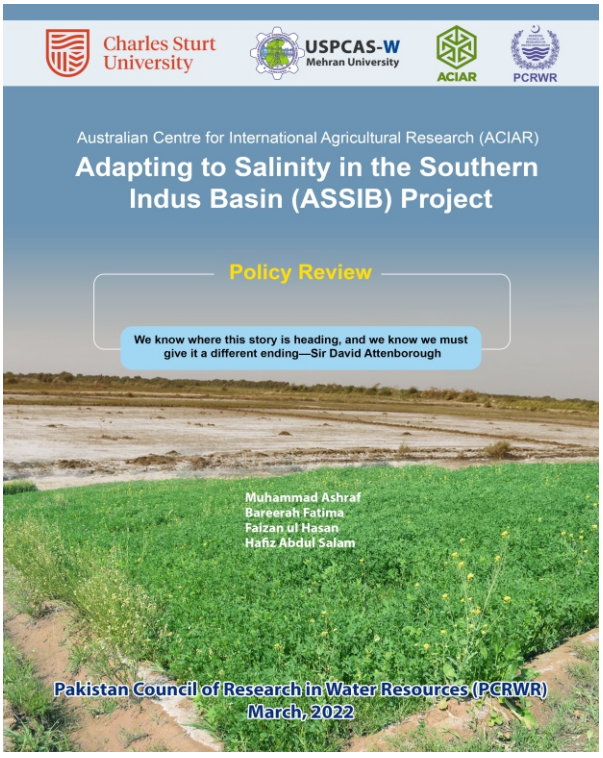
Ashraf, M. Fatima, B., Hasan, F.U., & Salam, H. A. (2022). Adapting to Salinity in the Southern Indus Basin: Policy Review. Pakistan Council for Research in Water Resources, Islamabad, Pakistan, pp. 52.

Online available:

https://pcrwr.gov.pk/wp-content/uploads/2022/04/Adapting-to-Salinity-in-the-Southern-Indus-Basin-ASSIB-Project-2022.pdf

Executive Summary

Salinity is an inherent feature of the Indus Basin Irrigation System, along with many other land and water resource issues that need to be managed. The scourge of salinity was first witnessed in the Indus plains in 1945, when the Directorate of Land Reclamation was established in the Punjab Irrigation Department under British rule. The situation became so pronounced that development and strategic initiatives had to be undertaken within the first five years of Pakistan's independence in 1947. Under the Colombo Plan, the extent of salinity was determined using aerial surveys, which was the best



possible technology at that time. Over time, many reports and plans by well-recognized experts surfaced, yet the massive development of Pakistan's water resources continued unabated, accentuating the salinity and waterlogging problems due to secondary salinization. Many strategies and development initiatives needed to be undertaken to manage the salinity problem, even while the irrigation system was still expanding to bring more areas under crop cultivation. From the 1960s onwards, such efforts hastened the need to undertake major projects for drainage and the reclamation of saline and waterlogged lands.

This report provides a chronological review of all these initiatives firstly by analyzing literature contributed by professionals of those periods, development reports by relevant institutions, policy discussion papers, technical working papers, project completion reports and departmental websites. Secondly, to supplement this analysis, consultations were organized with relevant organizations and other stakeholders focusing on the southern Indus Basin using a set of key questions that emerged from the literature analysis, as well as a thematic analysis of a report prepared as part of the scoping for the Adapting to Salinity in the Southern Indus Basin (ASSIB). Focus Group Discussions (FGDs) and individual interviews were conducted to solicit expert perspectives from professionals and other specialists currently working on salinity-related management issues. The overall analysis of this policy review reveals three core gaps contributing to the ineffectiveness of strategies and programs:

1. Lack of policy guidance for sustainability and planning for implementing a long-term salinity management strategy.
2. Non-consolidation of data collection and research conducted by various organizations and lack of mechanisms to enforce sharing of data.
3. Lack of farmers participation in decision-making processes.

The key conclusion from the study is that the farming community, despite being challenged by the increasing extent of salinity, have had to rely on their own experiential adaptation to enable them to “live with salinity”. That is, even after decades of research related to salinity management, farmers have been left to manage their salinity on their own by experimenting with various land conservation and reclamation practices, which could be augmented with more effective and practical solutions through more effective engagement with the research community. The situation calls for a total transformation of attitudes and behaviors, and the contribution of this policy review is to propose a way forward for the sustainability of living with salinity.

Drinking Water Quality in Pakistan Current Status and Challenges

Authors:

Hifza Rasheed
Fouzia Altaf
Kiran Anwaar
Muhammad Ashraf

Citation:

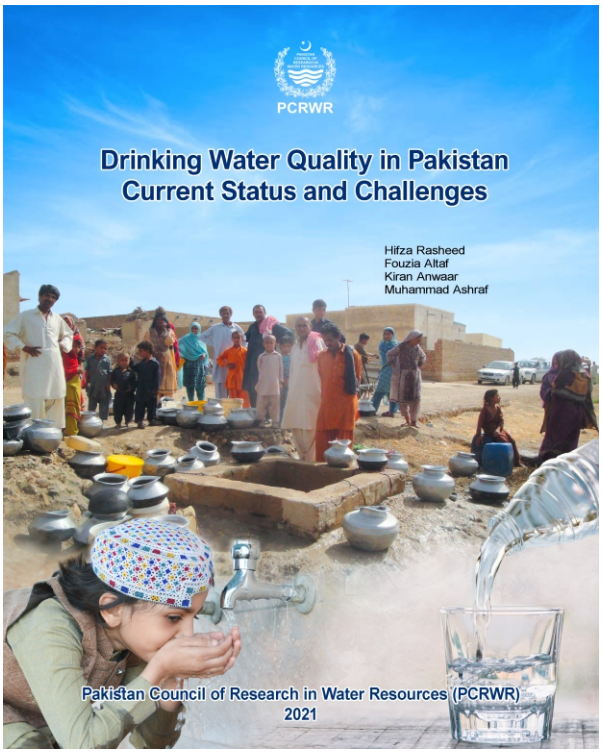
Hifza, R., Fauzia. A., Kiran, A., and M. Ashraf (2021). Drinking Water Quality in Pakistan: Current Status and Challenges. Pakistan Council of Research in Water Resources (PCRWR), Islamabad, pp. 141.

Online available:

https://pcrwr.gov.pk/wp-content/uploads/2021/10/Drinking-Water-Quality-in-Pakistan-2021.pdf

Executive Summary

The National Water Quality Monitoring Program (NWQMP) implemented by the PCRWR from 2001 to 2010 generated the first ever annual water quality profile of the country covering 24 cities. This program was continued as a regular activity with monitoring frequency of five years. Following this, with addition of two more cities, it was extended to total 26 cities of Pakistan in 2015-16. This monitoring phase revealed that only 31% of the monitored water sources were safe for drinking purpose. The current water quality monitoring of 2020 is the national program implemented in 29 cities of four provinces, AJ&K and



Gilgit-Baltistan. The water quality data when compared with the National Standards for Drinking Water Quality showed that out of total 435 sources, 168 (39%) sources were safe, whereas 267 (61%) sources were unsafe for drinking.

In the Federal Capital Islamabad, 71% sources were found safe and 29% as unsafe due to bacteriological and Iron contamination. In Bahawalpur city, 76% water sources were found unsafe due to bacteriological (20%), Arsenic (38%), Iron (36%), TDS (24%), Turbidity (20%), Hardness (16%) and Fluoride (4%). In Faisalabad, 59% monitored sources were found unsafe due to high TDS (23%), Iron (23%), Chlorides (23%), Nitrate (18%), Hardness (14%), bacteriological contamination (14%) and Fluoride (9%). In Gujranwala, 50% sources were contaminated because of bacteriological contaminations. In Gujrat, all the monitored sources were found safe. In Kasur, 10% sources were unsafe due to bacteriological contamination and high turbidity.

Lahore, the second largest city of Pakistan has shown 69% of safe and 31% unsafe sources due to bacteriological (12%), Arsenic (6%), Iron (6%) and TDS (6%). The city of Multan has not shown any improvement in water quality i.e. 19% safe in 2015 which decreased to 6% in 2020, bacteriological contamination of 69% and Arsenic (63%). In Rawalpindi, 38% of the monitored sources were contaminated due to bacteriological contamination (38%), Nitrate (15%), Iron (15%) and TDS (8%). In Sargodha city, 83% sources were unsafe for drinking purpose because of bacteriological contamination (21%), Hardness (58%), TDS (58%), Chloride (38%), Nitrate (38%), and Iron (21%). In Sheikhupura, 60% of the monitored sources were supplying unsafe water to the public mainly due to bacteriological contamination (20%) and excessive Nitrate (30%), Hardness (20%), TDS (20%), Arsenic (10%), Turbidity (10%), and Iron (10%). In Sialkot, all the monitored sources were providing safe water to the public.

In Khyber Pakhtunkhwa, samples were collected from Abbottabad, Mangora, Mardan and Peshawar cities. Overall the water sources were found bacteriologically safe. However, chemically sources were unsafe because of higher level of Iron. The Iron contaminated sources comprised 50% from Peshawar, 55% from Abbottabad, 20% from Mangora, and 45% from Mardan.

In Quetta, the capital of Balochistan, 65% of the monitored sources were unsafe due to bacteriological contaminants (57%), Fluoride (27%),

Chlorides (3%), Hardness (3%) and TDS (3%). In Khuzdar, 55% sources were unsafe for drinking because of bacteriological contamination (36%), Turbidity and Nitrate (9%). In Loralai city, 59% sources were supplying contaminated water due to excessive Turbidity and Iron (6%) and bacteriological contamination (59%). In Ziarat city 45% sources were unsafe for drinking purposes due to bacteriological contaminants (45%) and Iron (9%).

In Hyderabad city, 80% of the monitored sources were found contaminated and unsafe for drinking because of bacteriological contamination (73%), Turbidity (60%), Hardness (7%), Chlorides (7%) and TDS (7%). In Karachi, 93% sources were unsafe mainly due to bacteriological contamination (93%), Fluoride (7%), Chlorides and TDS (11%), Turbidity and Hardness (4%). In Sukkur city, 67% of the total sources were found contaminated and unsafe for drinking purposes due to higher concentration of Iron (44%), Chloride and TDS (33%), Hardness, Turbidity, Fluoride and bacteriological contamination (22%) and Arsenic (11%). From Badin city, only one source was found supplying safe drinking water to the community. Major causes of contamination were bacteriological contamination (58%) and chemical contaminations (58%). In Mirpur Khas, 100% of the monitored sources were found unfit for drinking purposes. This was mainly due to Total Coliforms (100%), Chloride (67%), Hardness and TDS (75%), Turbidity (42%) and Iron (17%). In Tando Allah Yar city, 57% drinking water sources were found unfit for drinking purpose due to microbiological contamination (36%), Hardness (14%), and TDS (36%). In Shaheed Benazirabad city, 100% of monitored sources were unfit for drinking purposes because of Total Coliforms (100%), Iron (54), TDS (46%), Chloride (31%), Hardness (23%) and Turbidity (8%).

In Muzaffarabad city, 70% of the monitored sources were found contaminated mainly due to Total Coliforms (60%) and Turbidity (20%). In Gilgit, the monitored sources were found contaminated due to presence of Total Coliforms. Out of these, 50% were also having excessive Turbidity.

Overall analysis of 29 cities has identified 11 major water quality problems in drinking water sources of Pakistan i.e. 41% microbiological, TDS (14%), Iron (14%), Hardness (10 %), Turbidity (9%), Chlorides (8%), Arsenic (5%), Nitrates (4%), Fluoride (4%), and pH (1%).

Comparison of current status of safe water (39% in 2020) with 31% in 2015 reveals slow paced drinking water quality improvement in the

country. Consuming 61% of the unsafe waters may pose serious public health risk due to waterborne diseases such as diarrhea, dysentery, typhoid, hepatitis, skeletal and dental fluorosis, methemoglobinemia and cancer.

The water quality monitoring over the time can help identify the challenges in sustainable access to safe drinking water. The monitoring outcomes of 29 cities make us realize that all stakeholders such as Federal, Provincial and local Governments, local communities, industries, academia etc. need to play their roles in improving drinking water quality. In this context, establishing a comprehensive drinking water system that integrates water supply, quality and management is essential. This can be accomplished through substantial increase in investment on Water, Sanitation and Hygiene (WASH) sector, enhancement of institutional capacity, rehabilitation of existing water supply infrastructure, public-private partnership arrangements and introducing the concept of service delivery. Otherwise, it would be difficult to achieve the targets set in the Sustainable Development Goals (SDGs) particularly Goal 6.

Research Paper

Legal Framework to Control at Disposal Point Source Urban and Industrial Effluents of Hyderabad City in to Pinyari (Old Phulleli) Canal off-taking from Kotri Barrage, Sindh

Authors:

Ali Asghar Mahessar
Sardar Ali Shah
Rehana Anjum
Ghulam Murtaza Arain

Citation:

Mahessar et al. (2022). Legal Framework to Control at Disposal Point Source Urban and Industrial Effluents of Hyderabad City into Pinyari (Old Phulleli) Canal off-taking from Kotri Barrage, Sindh /Int.J.Econ.Environ.Geol.Vol. 13(2) 09-14

Abstract

Pinyari (old Phulleli) canal off - takes from left bank of Kotri barrage is last Hydraulic structure on Indus river. This canal is passing from periphery of Hyderabad city and its design discharge is 13,636 cusecs which supplies fresh water not only for agricultural, industrial purpose and drinking purpose for the several towns and villages because groundwater in its command area is highly saline and not drinkable. The cottage factories and Hyderabad industrial area are located on nearby banks of canal. Hence, effluents from city and industrial SITE area are directly disposed off into the canal. The disposal of untreated wastewater created health and environmental safety problem. This paper presents that the analyzed results of water quality parameter ie pH, TDS, EC, Na, hardness, K, Mg, Mn, DO and BOD of collected samples exhibit TDS 6%, K 20%, DO 67% and BOD 54%, respectively exceeded permissible limit. While pH, Na, hardness and Mn found within prescribed limits. Total coliform /E.coli (MPN/100ml) were found positive. Furthermore, the result of Water Quality Index (WQI) model reveals that water quality of canal of collected samples varies from excellent to very poor that reveals canal water is unsuitable for drinking purpose and aquatic life and also causes various waterborne diseases . Therefore, the local people are facing serious health problem by consuming water canal. With an attempt to ensure enforcement of environmental water laws in Sindh province of Pakistan for preventing degrading clean water. These environmental water laws have already been framed, but due to lake of enforcement, water pollution problems are increasing day by day. The enforcement of environmental water laws are very essential to control water pollution for safety of human health, and ecology in Sindh, Pakistan.

Research Paper

Optimization of Standalone Photovoltaic Drip Irrigation System: A Simulation Study

Authors:

Sajjad Miran, Muhammad Tamoor
Tayybah Kiren
Faakhar Raza
Muhammad Imtiaz Hussain
Jun-Tae Kim

Citation:

Miran, S.; Tamoor, M.; Kiren, T.; Raza, F.; Hussain, M.I.; Kim, J.-T. (2022). Optimization of Standalone Photovoltaic Drip Irrigation System: A Simulation Study.Sustainability,14, 8515

Abstract

This paper presents the optimal design of a photovoltaic (PV) drip irrigation system. Designing a PV system is based on calculated motor power, solar irradiance level and other meteorological parameters at a certain geographical location. Therefore, a simulation study of the designed PV system were performed by a PVGIS simulation tool. The PVGIS simulation tool analyzes the potential of power generation with optimal PV modules tilt angle and orientation on a monthly and annual basis, and an analysis of the overall shading situation (horizon) as well as the internal shading between the PV module rows. The selection of water pump and motor depends upon the depth of water table and desired discharge and head to operate the irrigation system. Furthermore, a locally developed Solar-Drip Simulation Tool (SoSiT) was used for load and supply optimization. Based on ambient temperature, solar irradiation and water requirements, SoSiT calculates net generation by a PV system and resultant water output of the irrigation system. The particular drip irrigation site has two zones; the maximum water requirement for zone 1 (row crop) is 50,918.40 Liters/day and for zone 2 (orchards) is 56,908.80 L/day. From PVGIS simulation results, the maximum daily energy production of the designed PV system was 6.48 kWh and monthly energy production was 201 kWh in the month of May. SoSiT results showed that the PV system fulfilled the required crop requirement by only using 28% of the potential water supply, and 72% of the potential water supply from a solar-powered pump was not used. This value is high, and it is recommended to grow more or different crops to utilize the fuel-free electricity from the PV system. The unit cost of PV-powered drip irrigation is USD 0.1013/kWh, which is 4.74% and 66.26% lower than the cost of subsidized electricity and diesel, respectively.

Research Paper

The Socio-Economic Impact of Using Photovoltaic (PV) Energy for High-Efficiency Irrigation Systems: A Case Study

Authors:

Faakhar Raza
Muhammad Tamoor
Sajjad Miran
Waseem Arif
Tayybah Kiren
Waseem Amjad
Muhammad Imtiaz Hussain
Gwi-Hyun Lee

Citation:

Raza, F.; Tamoor, M.; Miran, S.; Arif, W.; Kiren, T.; Amjad, W.; Hussain, M.I.; Lee, G.-H. (2022). The Socio-Economic Impact of Using Photovoltaic (PV) Energy for High-Efficiency Irrigation Systems: A Case Study. Energies 2022, 15, 1198.

Abstract

This paper presents the results of a field study undertaken all over the Punjab, Pakistan, to evaluate the socio-economic and climatic impact of photovoltaic-operated high-efficiency irrigation systems (HEIS), i.e., drip and sprinkler irrigation systems. Nearly half of the rural population relies on agriculture for a living, and the recent energy crisis has had a negative impact on rural communities. Farmers' reliance on fossil fuels for the operation of irrigation systems has increased exponentially, resulting in the high costs of agricultural production. Primary data regarding on-farm agriculture and irrigation practices used in this study were collected through an intensive on-farm survey, while secondary data were taken from published reports and statistics. The results of the current investigation show that the installation of PV systems has resulted in the increased adoption of high-efficiency irrigation systems, a reduction in the high operational costs incurred on account of old diesel-powered pumping systems (with an annual saving of 6.6 million liters of diesel), a 100% increase in farmer's income, a reduction of 17,622 tons of CO_2 emissions per annum, and 41% savings in water. The unit cost of PV-powered HEIS was found to be 0.1219 USD/kWh, which was 4% and 66% less than subsidized electricity cost and diesel cost, respectively.

Research Paper

Groundwater quality and availability assessment: A case study of District Jhelum in the Upper Indus, Pakistan

Authors:

Hifza Rasheed
Naveed Iqbal
Muhammad Ashraf
Faizan ul Hasan

Citation:

Hifza Rasheed, Naveed Iqbal, Muhammad Ashraf, Faizan ul Hasan. (2022). Groundwater quality and availability assessment: A case study of District Jhelum in the Upper Indus, Pakistan. Environmental Advances, Volume 7, 2022

Abstract

People's well-being and their economic development are linked to the availability and accessibility of water. The Pind Dadan Khan tehsil located on the right bank of River Jhelum is a classic example of water stressed confronting water quality and quantity issues. To evaluate usable potential and qualitative variations of groundwater, an integrated approach involving geophysical, water quality and risk assessment techniques was used. Accordingly, groundwater potential zones were categorized. A small shallow fresh groundwater pocket with acceptable water quality (<1.5 dS/m) for a depth between 15 m to 50 m exists in the eastern part of the study area. The groundwater of remaining tehsil was highly saline (TDS: 3852.23±5091.54 mg/L with maximum level up to 23164.03 mg/L). The quality of domestic wells at these 82 sites was unsafe (90%) due to salts, bacteriological contamination (71%), fluoride (45%), arsenic (5%), and nitrate (4%). Compared to these, public water supply schemes show comparatively lower salts (total dissolved solids of 144-2690 mg/L). However, arsenic was found beyond the WHO Drinking water guidelines (10 µg/L) in 65% sources which may pose serious cancer risks for 2 to 5 persons (maximum 12 persons) per 10,000 population.

The study reveals that the freshwater in the study area is scarce and of vulnerable quality and require integrated water quantity and quality management. Our results also suggest that in arid to semi-arid regions, scoring factors based on salinity levels and relative size of the saline zone should be incorporated into indicators of water access and availability.

Research Paper

A Sustainable Irrigation System for Small Landholdings of Rainfed Punjab, Pakistan

Authors:

Marjan Aziz
Sultan Ahmad Rizvi
Muhammad Azhar Iqbal
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Nazia Tahir
Sana Asghar
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Citation:

Aziz, M.; Rizvi, S.A.; Iqbal, M.A.; Syed, S.; Ashraf, M.; Anwer, S.; Usman, M.; Tahir, N.; Khan, A.; Asghar, S.; Akhtar, J. A. (2021). Sustainable Irrigation System for Small Landholdings of Rainfed Punjab, Pakistan. Sustainability 2021, 13, 11178

Abstract

Drip irrigation has long been proven beneficial for fruit and vegetable crops in Pakistan, but the only barrier in its adoption is the high cost of installation for small landholders, which is due to overdesigning of the system. In the present study, the cost of a conventional drip irrigation system was reduced by redesigning and eliminating the heavy filtration system (i.e., hydrocyclon, sand media, disc filters (groundwater source), pressure gauges, water meters, and double laterals).Purchasing the drip system from local vendors also reduced the cost. Field trials were conducted during 2015 and 2016 to observe the productive and economic effects of low-cost drip irrigation on vegetables (potato, onion, and chilies) and fruits (olive, peach, and citrus). The low-cost drip irrigation system saved 50% cost of irrigation and increased 27–54% net revenue in comparison with the furrow irrigation system. Further, water use efficiency (WUE) was found from 3.91–13.30 kg/m^3 and 1.28–4.89 kg/m^3 for drip irrigation and furrow irrigation systems, respectively. The physical and chemical attributes of vegetables and fruits were also improved to a reasonably good extent. The present study concluded that low-cost drip irrigation increased the yield by more than 20%, as compared with traditional furrow irrigation, and thus, it is beneficial for the small landholders (i.e., less than 2 hectares).

Research Paper

Effectiveness of Sodium Bentonite Clay for Reducing Seepages from Earthen Rainwater Harvesting Ponds

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Abstract

In drylands, livelihood entirely depends on rainwater, which is mostly stored in surface earthen ponds. However, the seepage and evaporation losses from these ponds reduce their effectiveness. A number of techniques have been tried to reduce such seepage losses such as mud plaster, laying polythene sheets etc. However, their cost-effectiveness and sustainability remained questionable. In this research, a series of experiments were conducted to determine effectiveness of bentonite clay in reducing seepage from the bed and side walls of trapezoidal dug off ponds. Each experiment was replicated thrice. Water level in the pond was maintained at 0.40 m depth by refilling it frequently and recording seepage-rate. The seepage rates were initially higher and gradually declined to attain steady state in almost four hours. The final seepage rates were compared to find the most effective treatment. It was found that sodium bentonite can exclusively seal the beds of the ponds. The 2.5 cm thick layer composed of 50% sodium bentonite, 25% soil (sandy loam) and 25% chopped wheat straw was found to be the most appropriate material for pond lining.

Articles in Magazines

- Ashraf, M. (2021). Responding to the Climate Change Challenge in Pakistan. Hilal English, pp. 5-7.
- Ashraf, M. (2022). Water Conservation and Management in Pakistan. Hilal English, pp 46-49.
- Ashraf, M. (2021). Recharging Aquifers for Sustainable Groundwater Management. Hilal English, pp. 41-44.

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